2005 PRECISION

AGRICULTURAL SERVICES

DEALERSHIP SURVEY RESULTS

SPONSORED BY *CROPLIFE* MAGAZINE

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AGRICULTURAL BUSINESS

by

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Staff Paper # 05-11

September 2005

Department of Agricultural Economics

Purdue University

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Abstract

Ten years ago, the agricultural industry was abuzz with talk about new precision technologies being introduced into crop production. Some felt precision technologies would revolutionize the industry, some felt they were going to be a great tool for better fertility diagnostics, while others thought that the cost of the technology would be so high that it would take many years before widespread adoption occurred. During these intervening years, precision technologies have been incorporated by the industry into a wide variety of applications, but not always in the ways that were anticipated a decade ago. This year marked the 10th year for the annual Precision Agriculture Dealership Survey sponsored by *Crop Life* magazine and Purdue University's Center for Food and Agricultural Business. As in previous years, the survey was designed to gain a better understanding of who is adopting precision technologies and how they are using precision technologies in their business.

Consistent with previous surveys, dealerships were asked questions about the types of precision services they offer and/or use in their businesses, the fees they are charging for precision services, how fast their customers are adopting precision agriculture practices, and how profitable they are finding precision services to be in their businesses. To get a better idea of the changes that have occurred in the past 10 years, this year dealerships were also asked to rate a list of benefits and opportunities of precision technology they had observed over the last decade. The list was generated from a question asked 10 years ago about the benefits and opportunities that dealerships expected precision technology to bring in the future.

Keywords: precision agriculture, crop input dealers, variable rate application, site-specific agriculture, technology adoption

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Introduction

Ten years ago, the agricultural industry was abuzz with talk about new precision technologies being introduced into crop production. Some felt precision technologies would revolutionize the industry, some felt they were going to be a great tool for better fertility diagnostics, while others thought that the cost of the technology would be so high that it would take many years before widespread adoption occurred. During these intervening years, precision technologies have been incorporated by the industry into a wide variety of applications, but not always in the ways that were anticipated a decade ago.

This year marked the 10th year for the annual Precision Agriculture Dealership Survey sponsored by *Crop Life* magazine and Purdue University's Center for Food and Agricultural Business. As in previous years, the survey was designed to gain a better understanding of who is adopting precision technologies and how they are using precision technologies in their business.

The survey was conducted in late January to early March 2005. The questionnaire was sent to 2500 retail agronomy dealerships across the U.S. A second questionnaire was mailed to participants approximately two weeks after the first one as a reminder to complete and return it. (See Appendix I to this report for a copy of the questionnaire.) A total of 403 questionnaires were returned, with 394 being usable, providing an effective response rate of 16 percent. This response rate was a bit lower than last year's rate of 18 percent. (Response rates have ranged from a high of 38 percent in 1996 to a low of 11 percent in 2001.)

Consistent with previous surveys, dealerships were asked questions about the types of precision services they offer and/or use in their businesses, the fees they are charging for precision services, how fast their customers are adopting precision agriculture practices, and how profitable they are finding precision services to be in their businesses. To get a better idea of the changes that have occurred in the past 10 years, this year dealerships were also asked to rate a list of benefits and opportunities of precision technology they had observed over the last decade. The list was generated from a question asked 10 years ago about the benefits and opportunities that dealerships expected precision technology to bring in the future.

Questionnaire and Data Analysis Notes

As in other years, questionnaires were deemed "unusable" for several reasons. Some questionnaires were not filled out completely; others were from wholesalers who did not sell directly to farmers; some respondents sold only seed, while a few were from farmers. This year, there were only 7 unusable questionnaires among the 403 returned.

In 2000 and 2001, the data were statistically weighted to have the same demographics as the 1999 data in order to make year-to-year comparisons more meaningful. These demographics

included the region, organizational type and outlet size in terms of sales. Several procedural changes in the survey process in those two years made this necessary (timing of the survey, survey length, etc.). As in 2002 to 2004, this year's data were not statistically different from the 1999 data in terms of these demographic variables and therefore the data used in this report have not been weighted.

In this report, data were analyzed to identify statistical differences by region (Midwest versus other states) and differences between organizational types within the Midwest. Where charts or data are provided for these breakouts, differences are statistically different at $p < .05$ unless specifically stated otherwise.

The Respondents

The 394 survey respondents came from 41 states, with the highest representation from Iowa and Illinois, each accounting for 9 percent of the respondents, and Minnesota with 8 percent
Figure 1). The Midwest was heavily represented in the distribution of respondents, with two-thirds of the respondents being from the Midwest states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North and South Dakota, Ohio and Wisconsin. Fifteen percent of the respondents were from the West, 12 percent were from the South and 7 percent were from the Northeast.

Responding dealerships represented a wide variety of organizational types with four out of 10 being cooperatives (41 percent), while 43 percent represented local independents and 13 percent were part of a national or regional chain of dealerships. Compared to 2004, this represents slightly fewer cooperatives (46 percent in 2004) and slightly more local independents and national/regional dealerships.

As in other years, cooperatives were a larger part of the sample in the Midwest (48 percent of respondents) compared to other states (28 percent of respondents) (Figure 2). Local independents were more heavily represented in non-Midwestern states, accounting for over half of the respondents (53 percent) compared to just over a third in the Midwest (38 percent). Regional/national organizations were also more heavily represented in non-Midwestern states (18 percent of respondents) compared to Midwestern states (10 percent of respondents).

Figure 1. States Represented

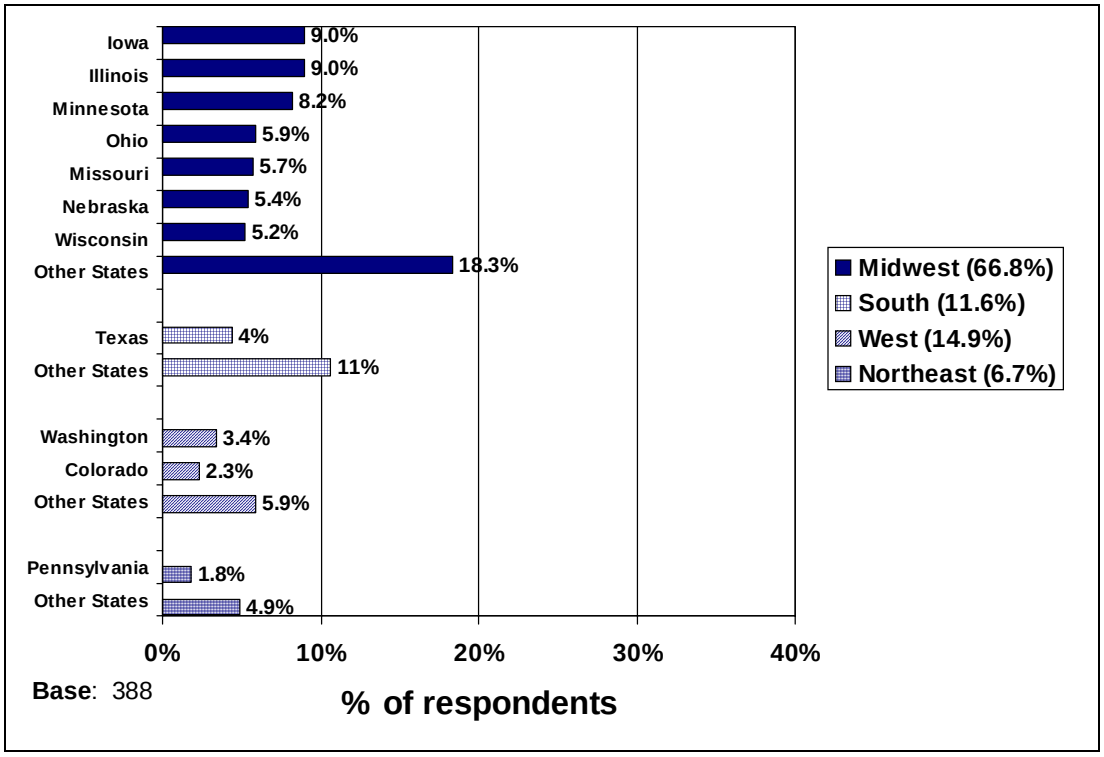
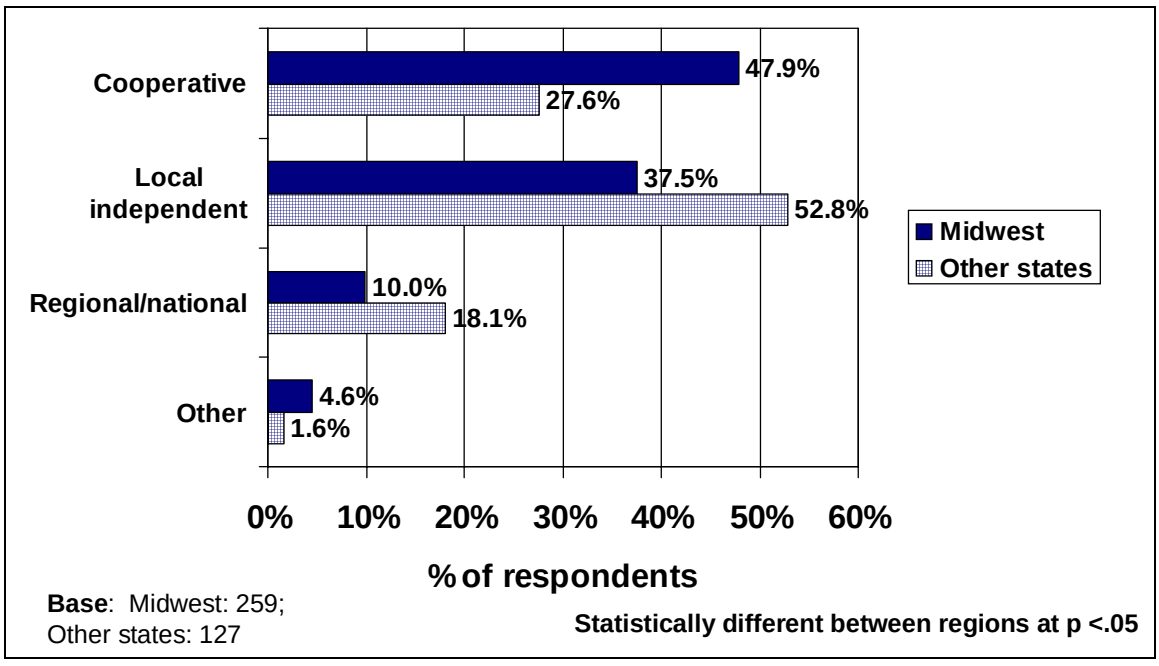


Figure 2. Organization Types by Region



The size of the responding dealerships ranged from one outlet (36 percent of the respondents) to more than 25 outlets (14 percent of the respondents) (Figure 3). When the number of retail outlets were broken out by region, respondents with only one retail outlet were the most common in both regions, but those in the Midwest were more likely to be from firms with 2 to 15 outlets while respondents in other states were more likely to represent large firms with over 25 outlets (Figure 4). In the Midwest, local independents were significantly more likely to have only one retail outlet (61 percent) while cooperatives typically had 2 to 15 outlets (39 percent) and regional/national organizations had over 25 outlets (65 percent of these respondents).

Figure 3. Number of Retail Outlets Owned or Managed

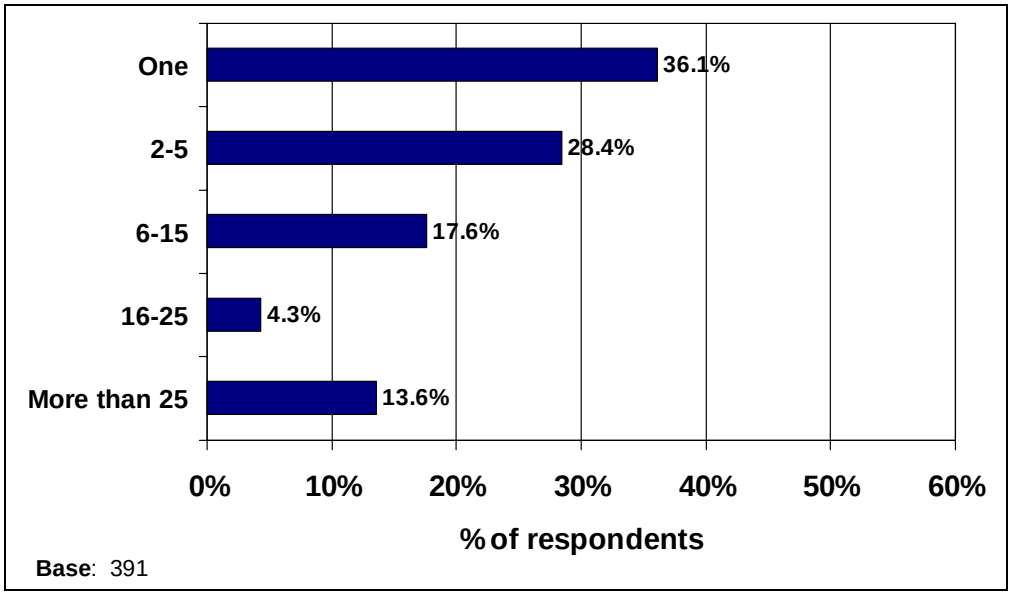
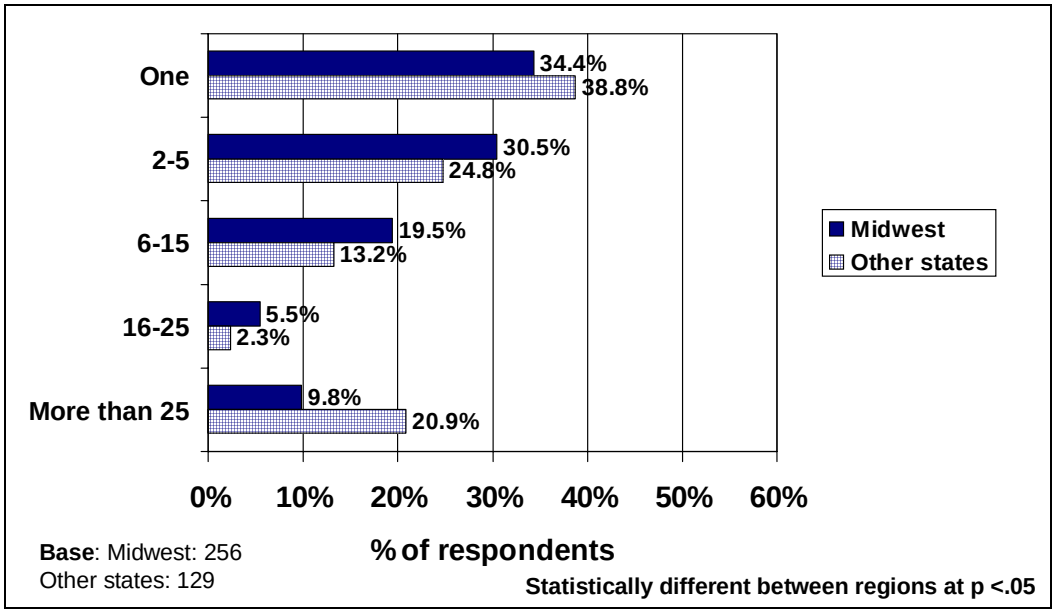


Figure 4. Number of Retail Outlets Owned or Managed by Region



Respondents also represented a range of outlet sizes. Fifteen percent of this year's respondents had annual agronomy sales of less than $1 million at their location, similar to last year, while 30 percent had $5 million or more in annual agronomy sales (Figure 5). When broken out by region, there were no significant differences in outlet size between respondents in the Midwest and other states. However, within the Midwest, there were significant differences in annual agronomy sales by organizational type. Local independents were not only smaller in terms of the number of outlets in their businesses, but their outlets were also significantly smaller in terms of agronomy sales dollars per outlet (Figure 6).

Figure 5. Total 2004 Annual Agronomy Sales at Location

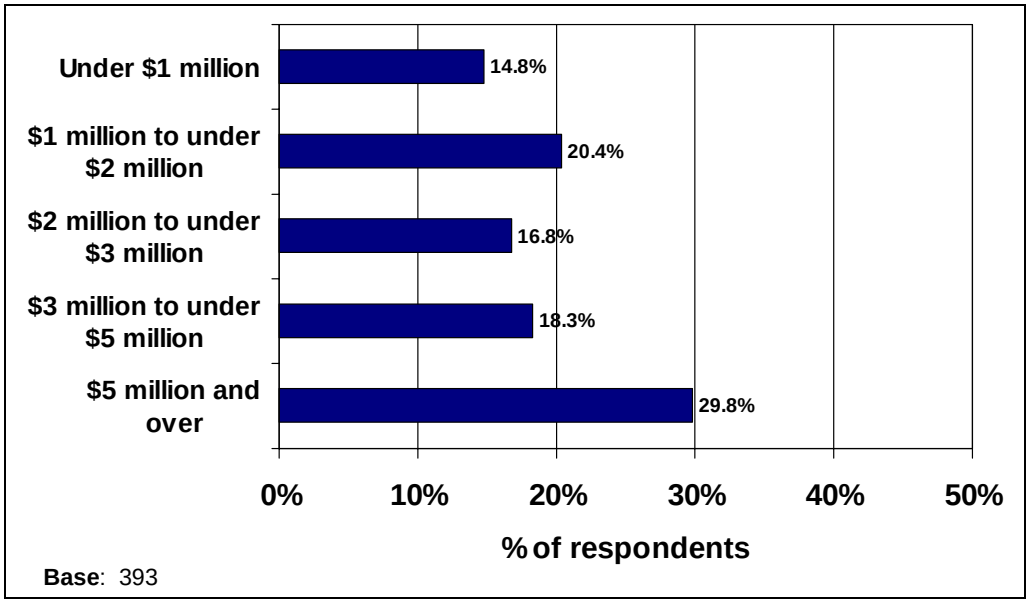
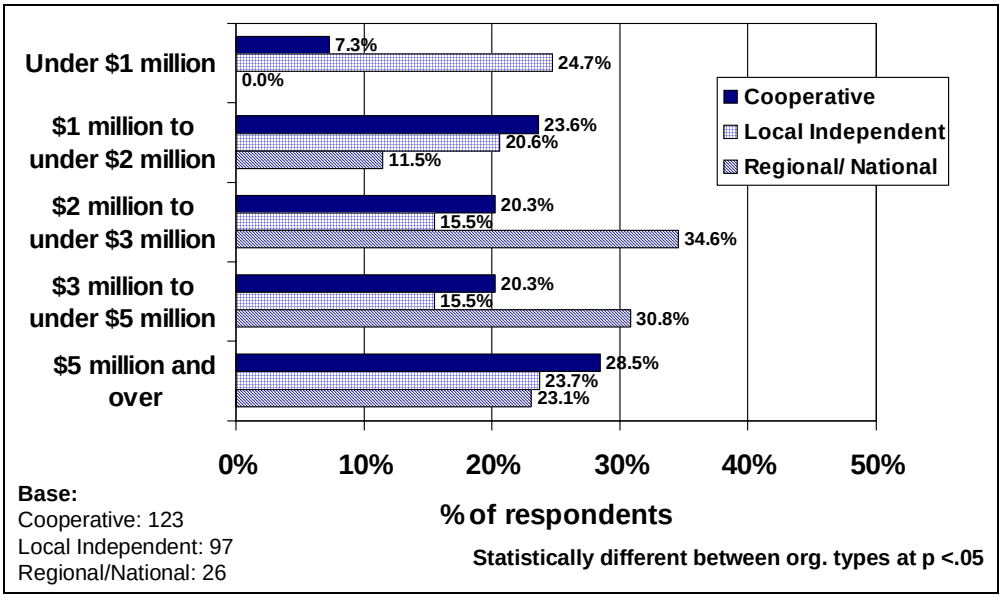
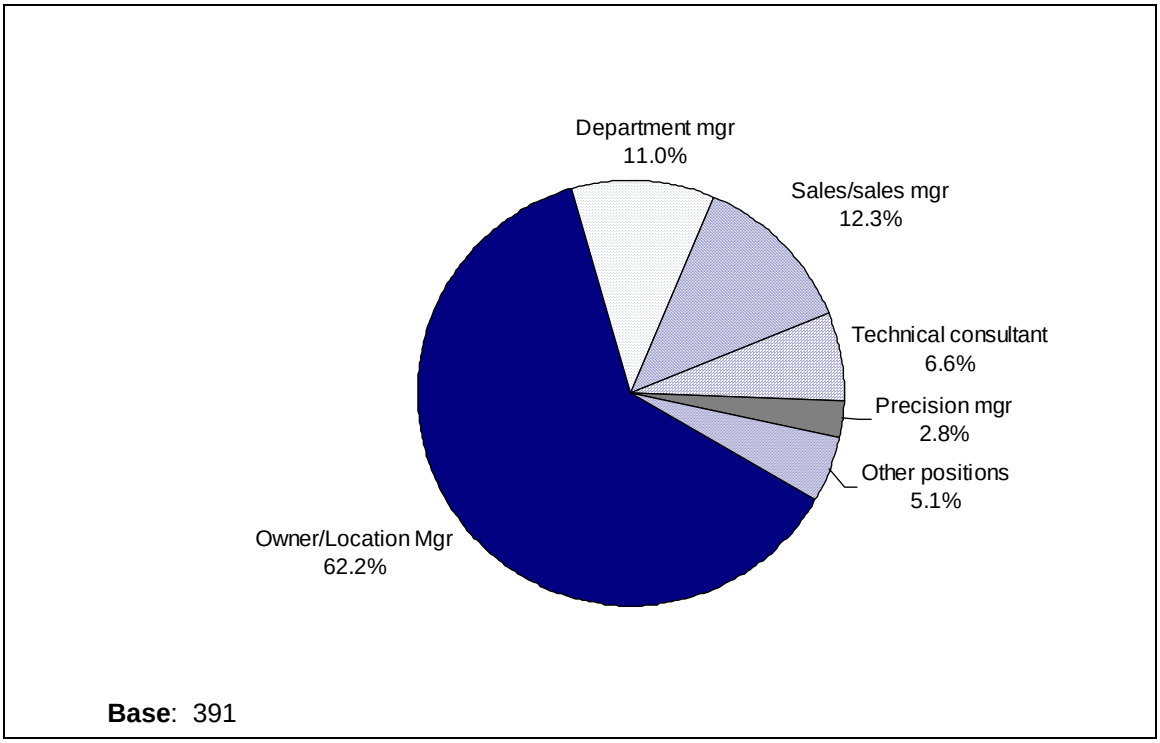


Figure 6. Total 2004 Annual Agronomy Sales at Location by Organizational Type in the Midwest



Two-thirds of the questionnaires were completed by the owner or manager of the outlet (62 percent), while 11 percent of the respondents were departmental managers (Figure 7). Technical consultants and precision managers accounted for 9 percent of the respondents. Respondents' positions did not vary regionally but they did vary by organizational type. In the Midwest, the owner/manager was the most common position for respondents from all three types of organizations. Eight out of 10 (80 percent) of the respondents representing local independents owned or managed the location, while 52 percent of the respondents representing cooperatives were the owners or managers and 48 percent of those representing regional/national organizations were owners/managers.

Figure 7. Responsibility of Survey Respondent



To better understand the size of growers in the dealerships' markets, respondents were asked for the average size (in acres) of their customers. 74 percent of the respondents said their average customer farmed more than 500 acres (62 percent of respondents) with 28 percent of the respondents indicating their average customer farmed more than 1000 acres (Figure 8). As expected, the average customer size varied greatly across geographic regions. Over half of the respondents in the Midwest said their average customer farmed between 501 and 1000 acres (56 percent) and another 25 percent of the Midwestern respondents said their average customer farmed over 1000 acres. The average customer size for dealerships in other (non-Midwestern) states was almost evenly divided among the four size categories (Figure 9) with a third of them (33 percent) indicating their average customer size was over 1000 acres. There were no statistical differences in average customer size across organizational types in the Midwest.

Figure 8. Average Customer Size

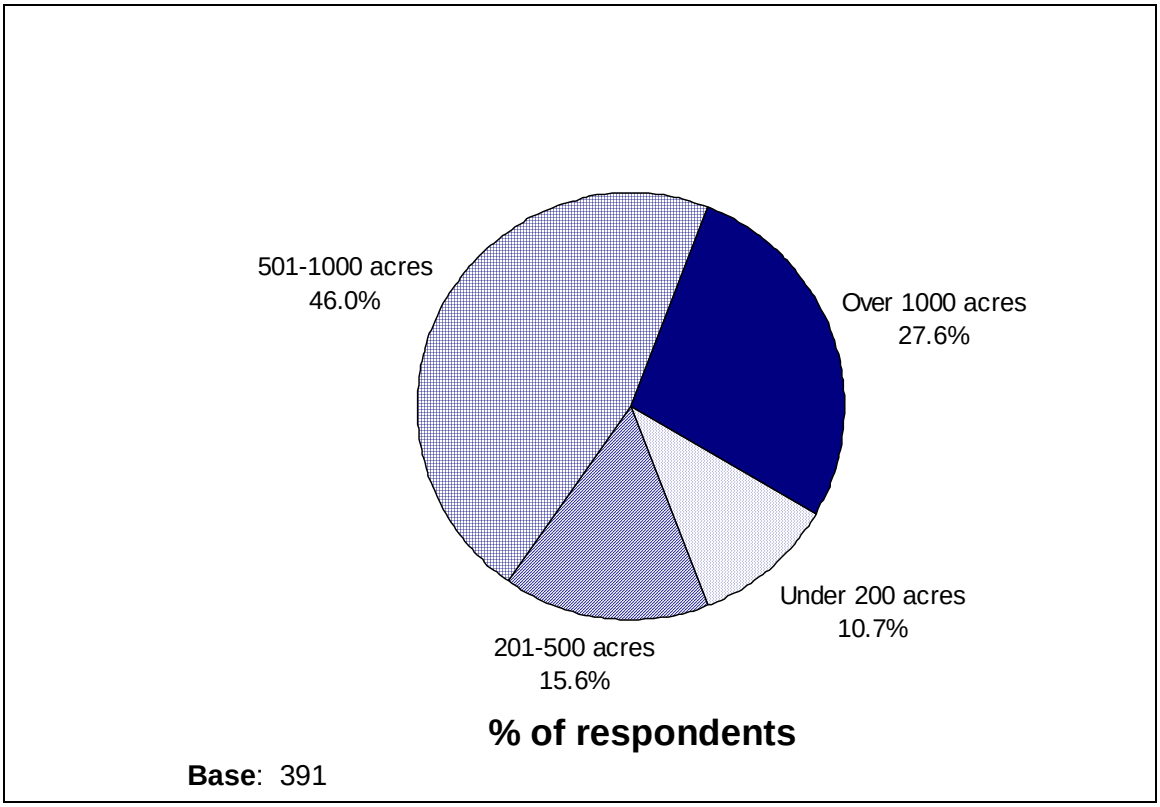
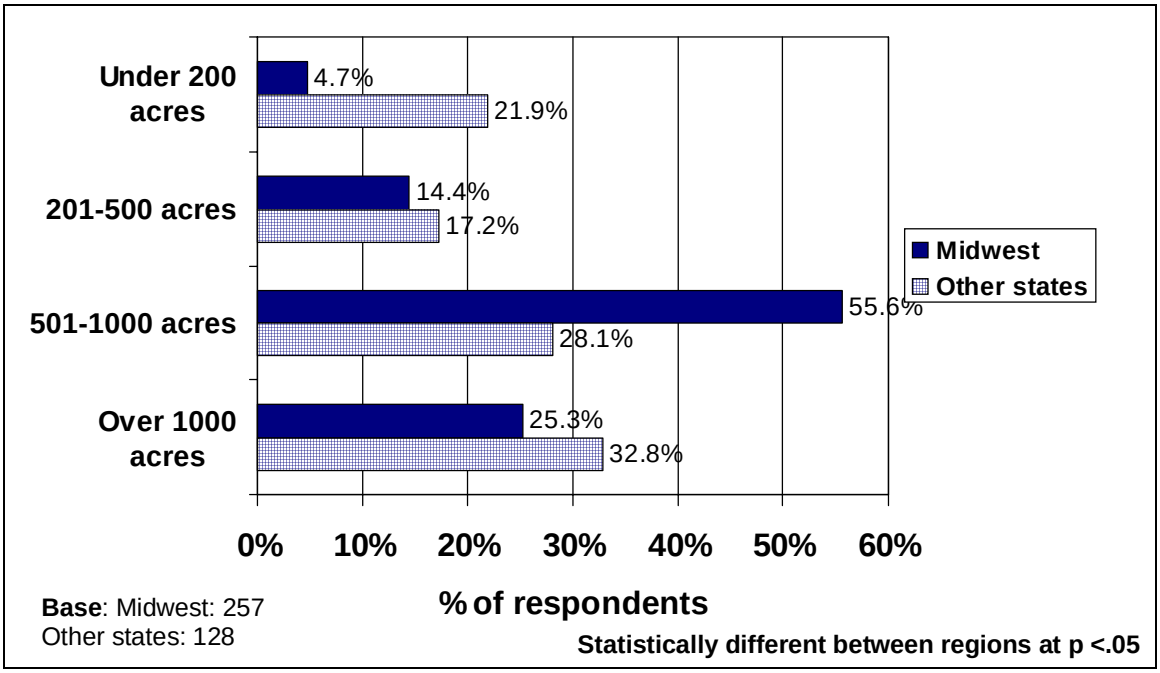


Figure 9. Average Customer Size by Region



Custom Application

Custom application was offered by 84 percent of the respondents. (Custom application here is defined as dealership application of fertilizer, pesticides, and/or custom seeding.) Over half of the respondents custom applied more than 25,000 acres per year (53 percent) (Figure 10). Across the U.S., however, custom application was most common in the Midwest where 88 percent of the respondents offered custom application services compared to 77 percent of the respondents from other states (Figure 11).

Figure 10. Acres Custom Applied

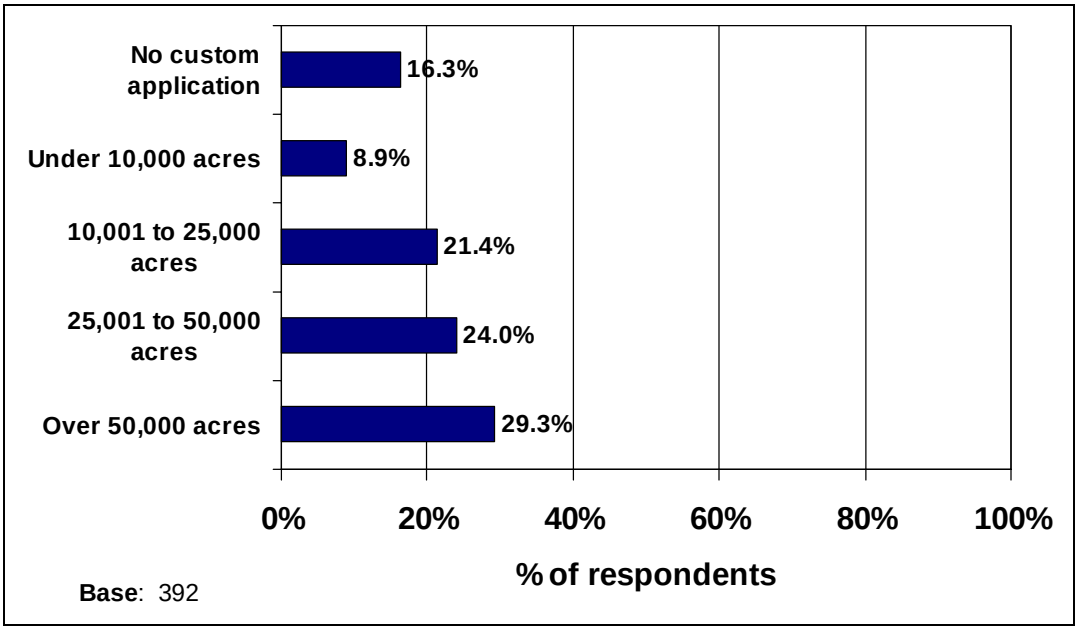
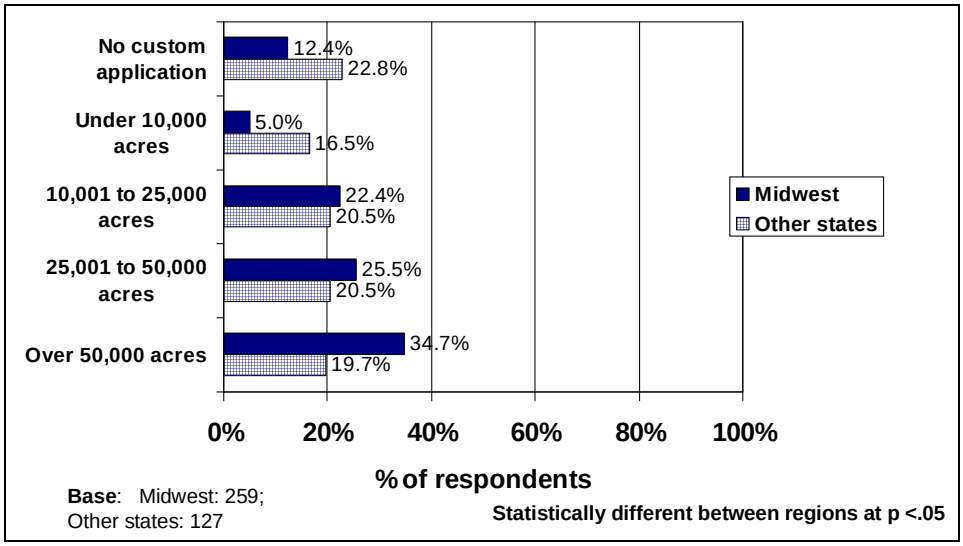
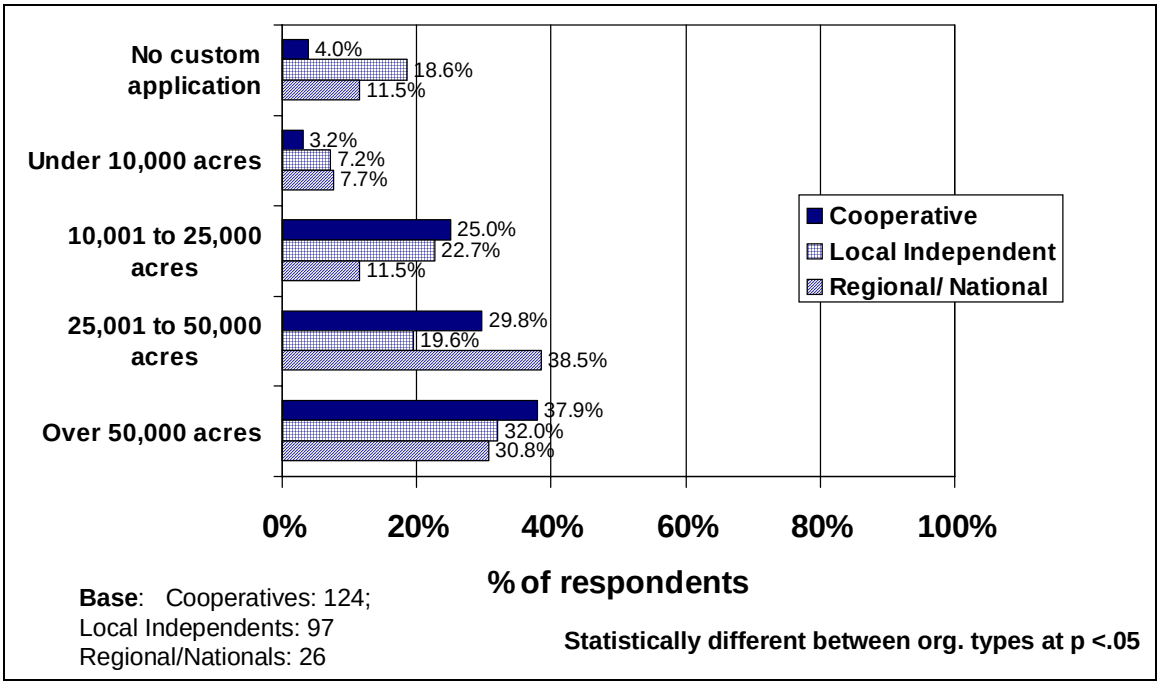


Figure 11. Acres Custom Applied by Region



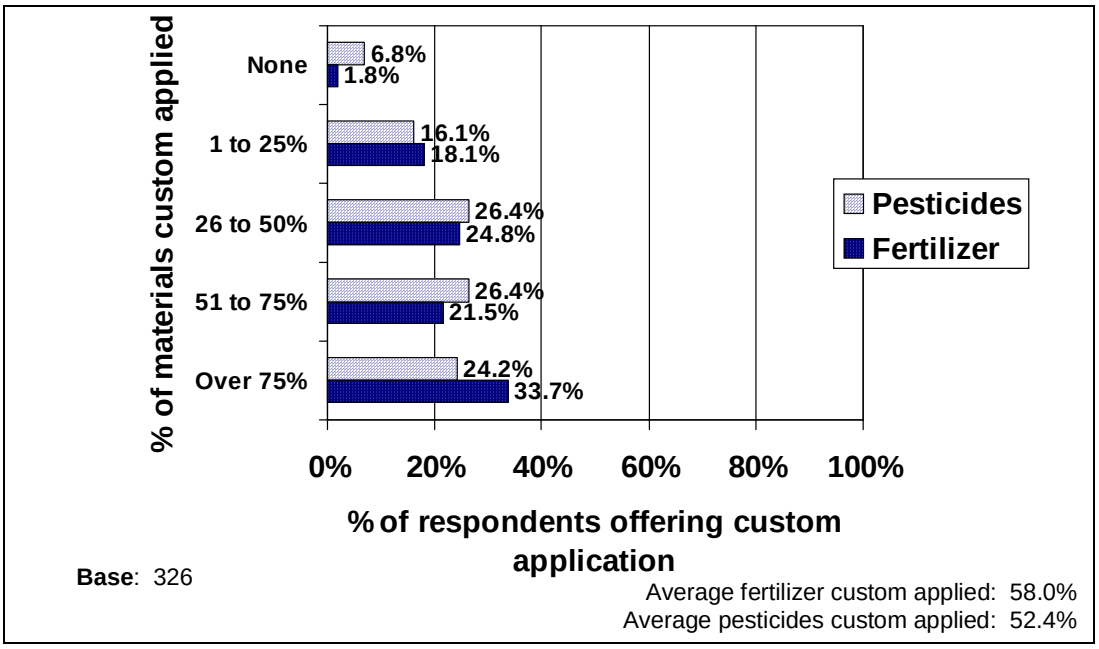
Reflecting the higher level of focus on services by cooperatives and regional/nationals, 96 percent of the respondents representing cooperatives and 89 percent of those representing regional/nationals in the Midwest offered custom application compared to 81 percent of the local independents (Figure 12). Over two-thirds of the cooperatives and regional/national outlets in the Midwest custom applied over 25,000 acres in 2005.

Figure 12. Acres Custom Applied by Organizational Type in the Midwest



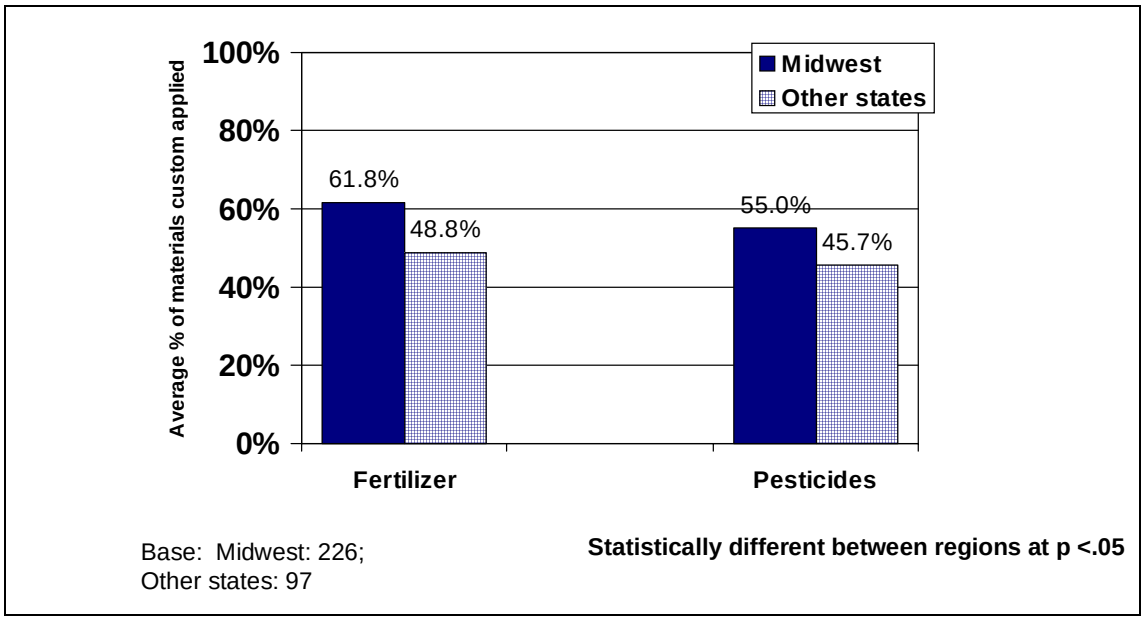
When asked specifically about custom application of fertilizer versus pesticides, respondents custom applied a slightly greater proportion of the fertilizer they sold relative to pesticides. On average, respondents *who indicated their outlet offered custom application* applied 58 percent of the fertilizer they sold and 52 percent of the pesticides they sold (Figure 13). A quarter of the respondents offering custom application said their dealership custom applied over 75 percent of the pesticides sold. Over a third of the respondents offering custom application said they custom applied over 75 percent of the fertilizer they sold.

Figure 13. Custom Application of Fertilizer and Pesticides



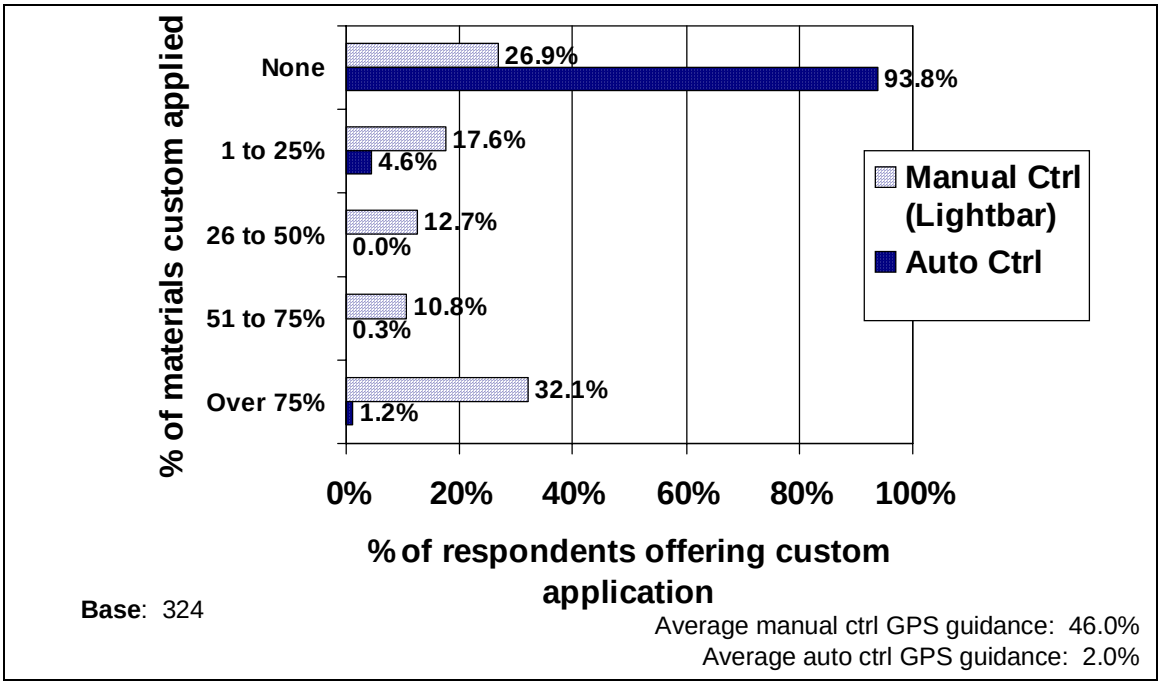
Those dealerships from the Midwest who offered custom application typically applied a greater proportion of what they sold. Midwestern respondents said they custom applied an average of 62 percent of the fertilizer they sold and 55 percent of the pesticides they sold while those from non-Midwestern states applied an average of 49 percent of the fertilizer sold and 46 percent of the pesticides sold (Figure 14). In the Midwest, there were no differences in the average amount of fertilizer or pesticides custom applied by organizational type.

Figure 14. Custom Application of Fertilizer and Pesticides by Region



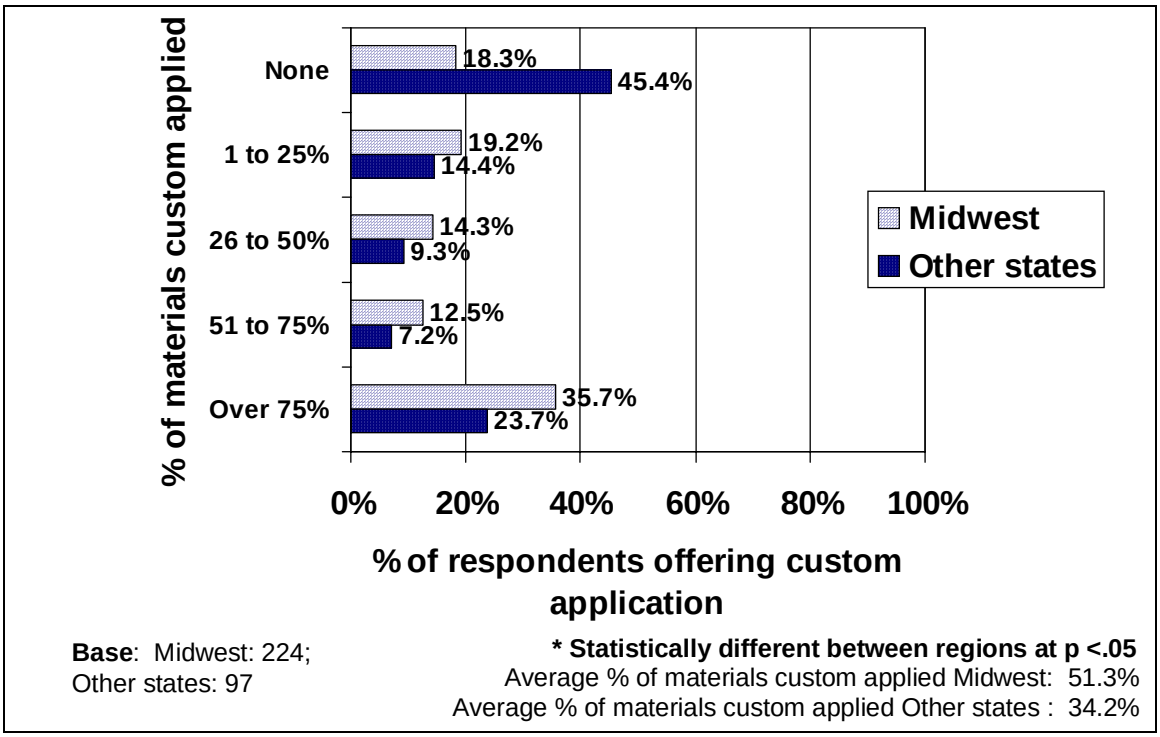
This year, we also asked respondents what percentage of their custom application was done using GPS guidance systems. Of those who offered custom application, 73 percent said they were custom applying at least some of the fertilizer/chemicals using a GPS guidance system with manual control/light bar (Figure 15). Only 6 percent said they used a GPS guidance system with auto control/auto steer for at least some of their custom application and most of those were using it on less than 25 percent of the materials they custom applied. Overall, an average of 46 percent of the materials custom applied were applied with GPS with manual control/light bar and 2 percent of the materials custom applied were applied with auto control GPS.

Figure 15. Use of GPS Guidance Systems for Custom Application



The use of GPS guidance systems with manual control/lightbars varied by region (Figure 16), with much heavier use in the Midwest than in non-Midwestern states. Over 80 percent of the respondents from the Midwest used some form of GPS guidance system with manual control, compared to only 55 percent of the respondents from non-Midwestern states. On average, 51 percent of the materials being custom applied in the Midwest were applied with manual control GPS guidance systems, compared to a third of the material in non-Midwestern states. These regional differences did not exist for GPS guidance systems with auto control (Figure 17).

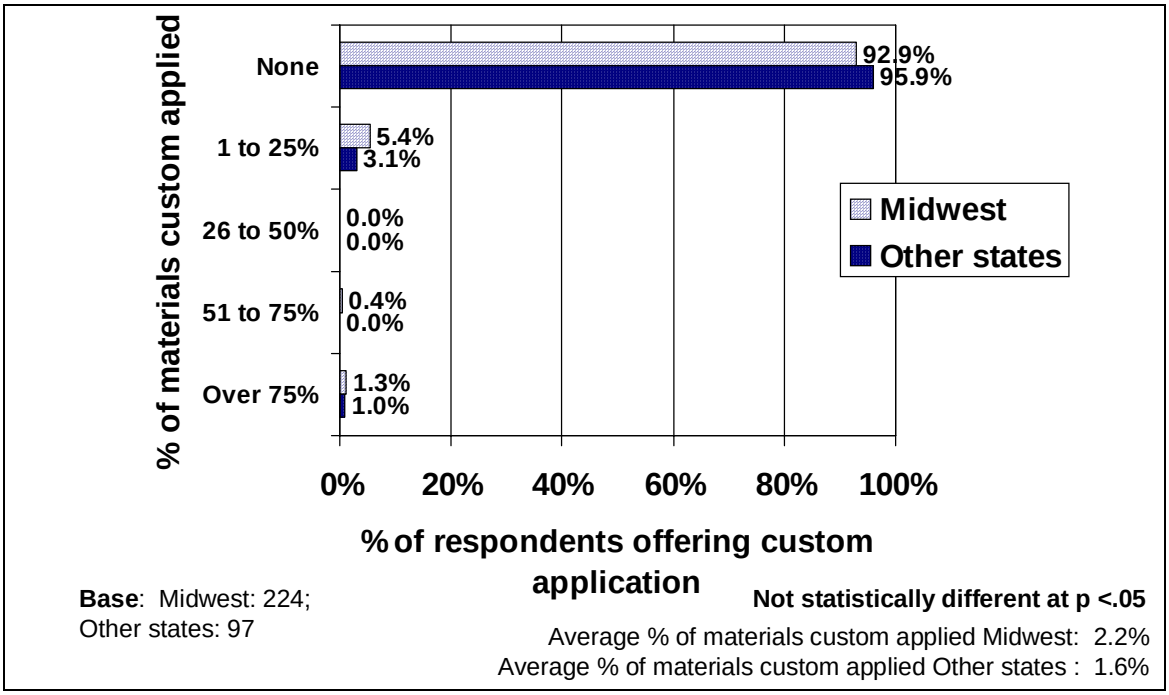
Figure 16. Use of GPS Guidance Systems for Custom Application by Region: Manual Control



Base: Midwest: 224;
Other states: 97

*** Statistically different between regions at p <.05**
Average % of materials custom applied Midwest: 51.3%
Average % of materials custom applied Other states : 34.2%

Figure 17. Use of GPS Guidance Systems for Custom Application by Region: Auto Control



Base: Midwest: 224;
Other states: 97

Not statistically different at p <.05
Average % of materials custom applied Midwest: 2.2%
Average % of materials custom applied Other states : 1.6%

In the Midwest, use of GPS guidance systems with manual control varied by organizational type (Figure 18). Overall, regional/national dealerships and local independents custom applied significantly more materials with guidance systems than cooperatives, though more cooperatives were trying the technology than the other two types of organization. Those regional/national and local independent dealerships that were using the GPS guidance systems were using them at a greater intensity, with almost half of those respondents applying more than 75 percent of the materials with the guidance system. Again, there were no significant differences in use of auto-control GPS guidance systems between organizational types in the Midwest (Figure 19).

Figure 18. Use of GPS Guidance Systems for Custom Application by Organizational Type in the Midwest: Manual Control

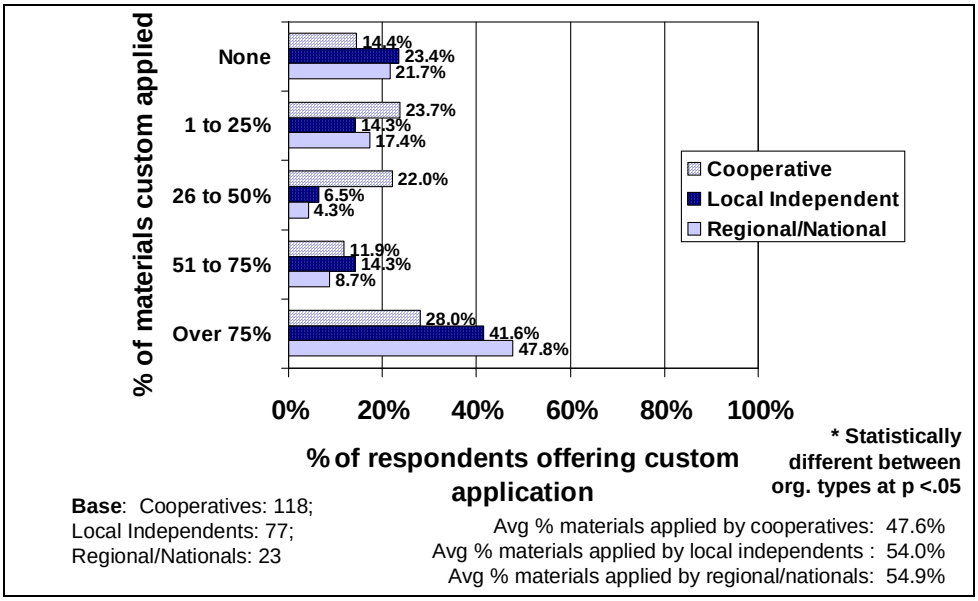
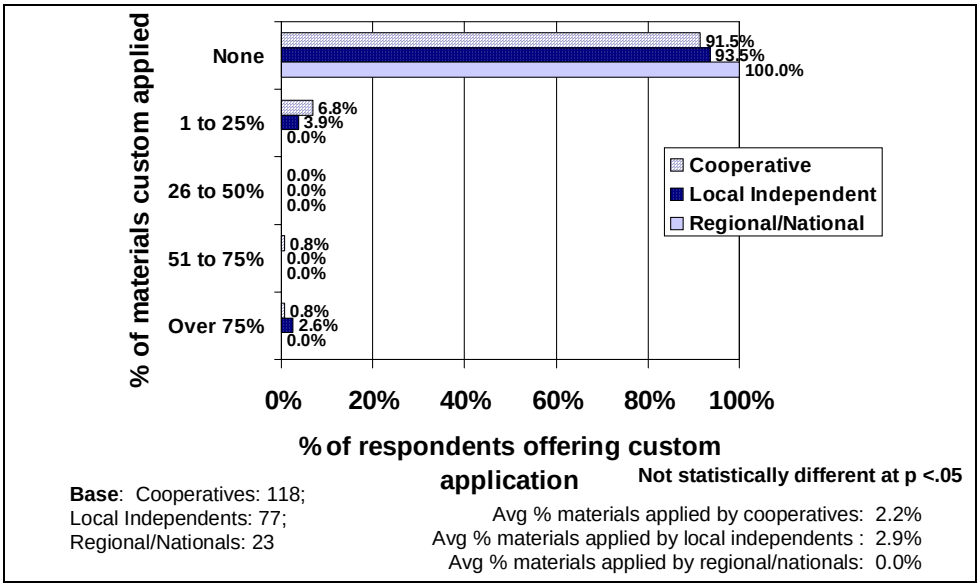


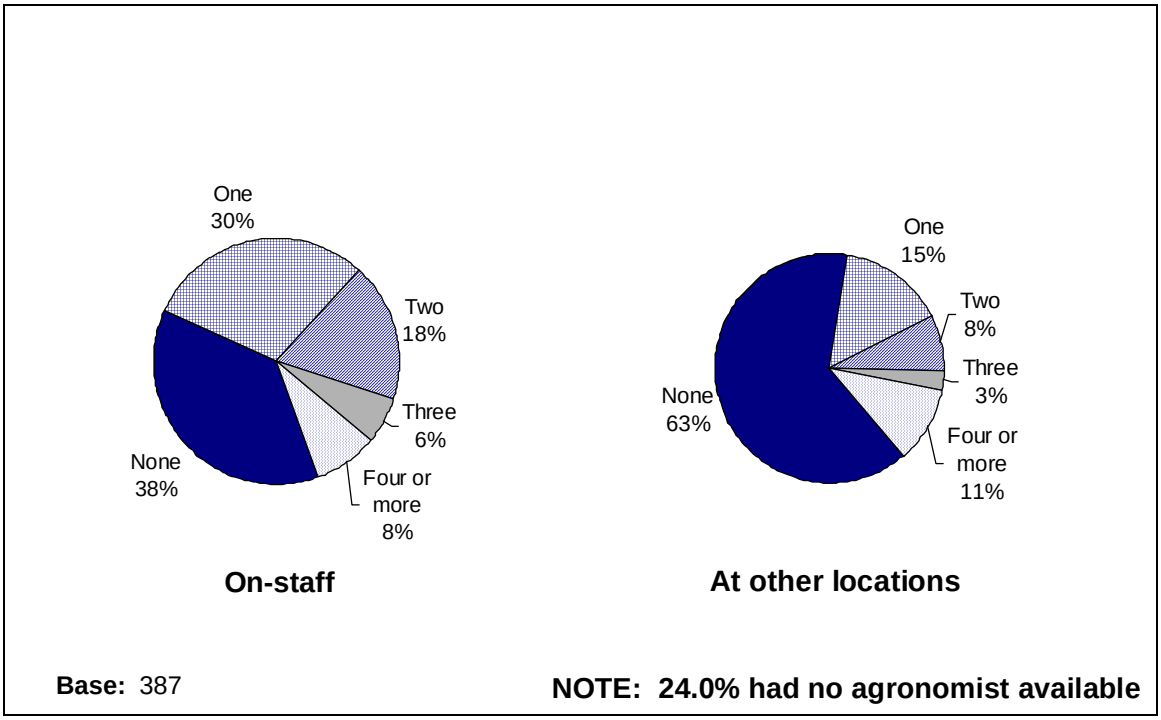
Figure 19. Use of GPS Guidance Systems for Custom Application by Organizational Type in the Midwest: Auto Control



Full-Time Agronomists

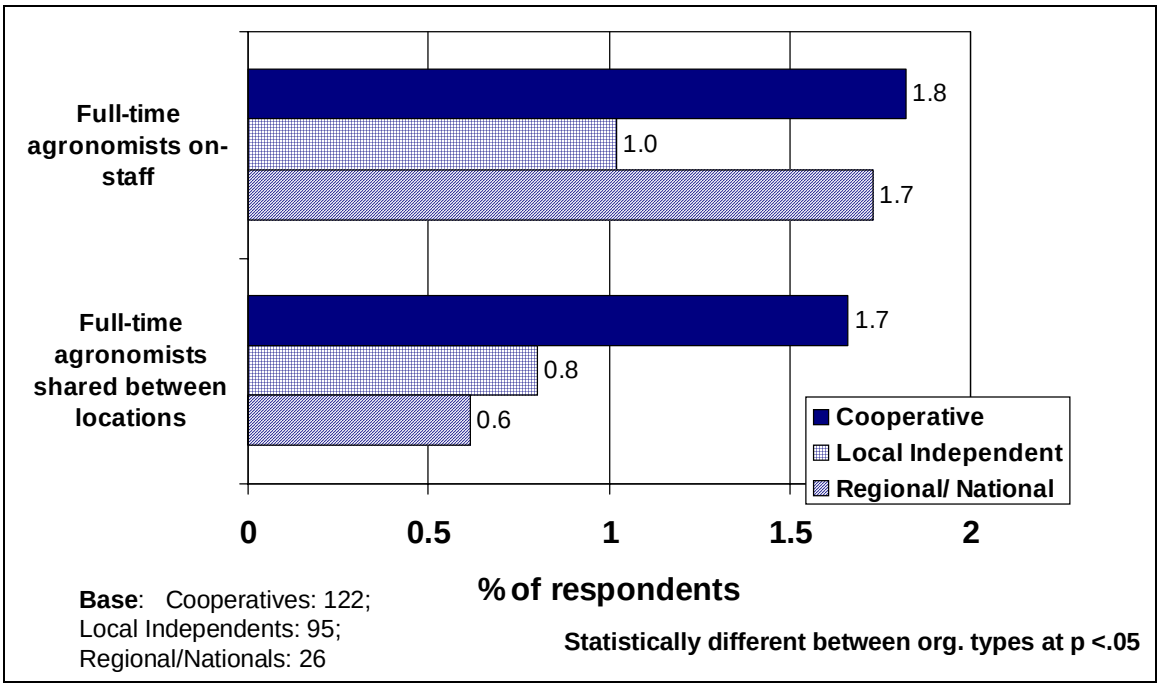
To support these services, many dealerships had agronomists available, either full-time on staff or shared with other locations. On average, the respondents had 1.4 full-time agronomists available on staff and shared an average of 1.7 agronomists with other locations. Two-thirds of the responding dealerships had at least one full-time agronomist on staff at their location (62 percent) (Figure 20), however several of those with no full-time agronomist at their location did have one available for their use at another location. A quarter of the respondents (24 percent) had no full-time agronomist available to them at all.

Figure 20. Full-time Agronomists Available



Though there were no differences in the number of agronomists available between regions, in the Midwest the type of organization did have an impact. Cooperatives had the largest number of agronomists available (an average of 1.8 on staff versus 1.7 agronomists available for regional/national organizations and 1.0 for local independents) (Figure 21). Regional/nationals were also more likely to have shared agronomists, with an average of 1.7 agronomists available that were shared between locations, compared to 0.8 shared agronomists for cooperative organizations and 0.6 for local independents.

Figure 21. Average Number of Agronomists Available by Organizational Type in the Midwest



Use of Precision Technologies and Offerings of Site-Specific Services

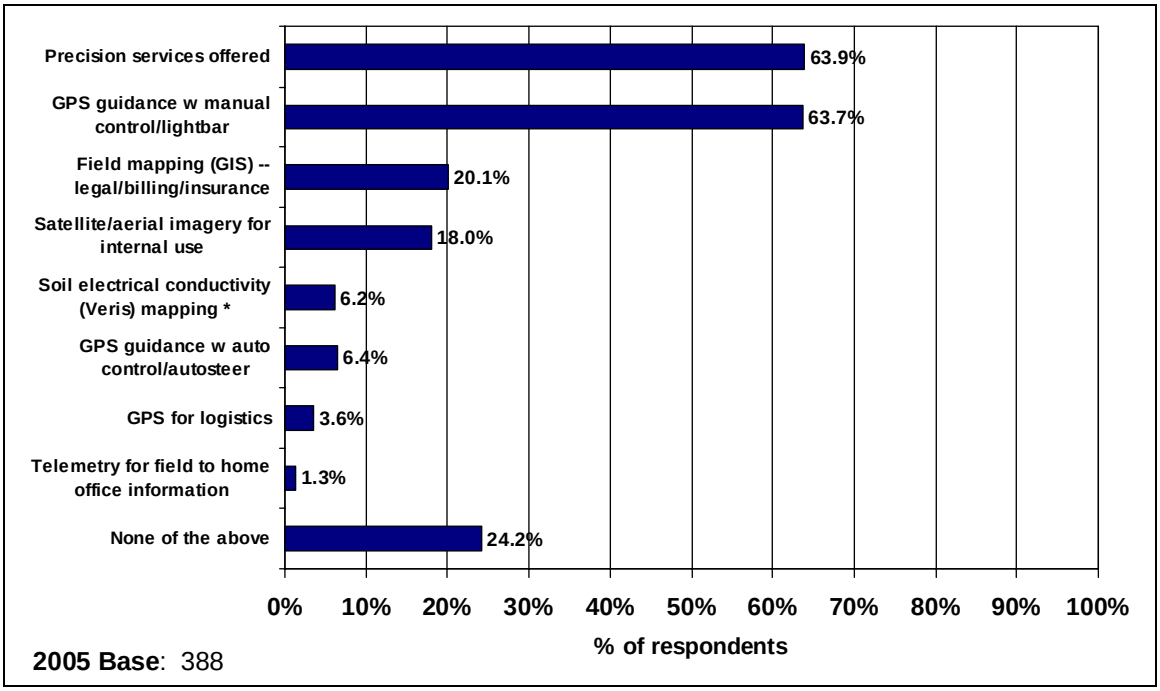
Respondents were asked several questions about their use of precision technologies and which site-specific services they were currently offering (or would be offering by the fall of 2005).

Use of Precision Technologies

Dealerships were asked how they were using precision technology in their dealerships – from offering their customers precision services to using precision technologies internally for guidance systems, billing/insurance/legal activities, logistics, or field-to-home office communications.

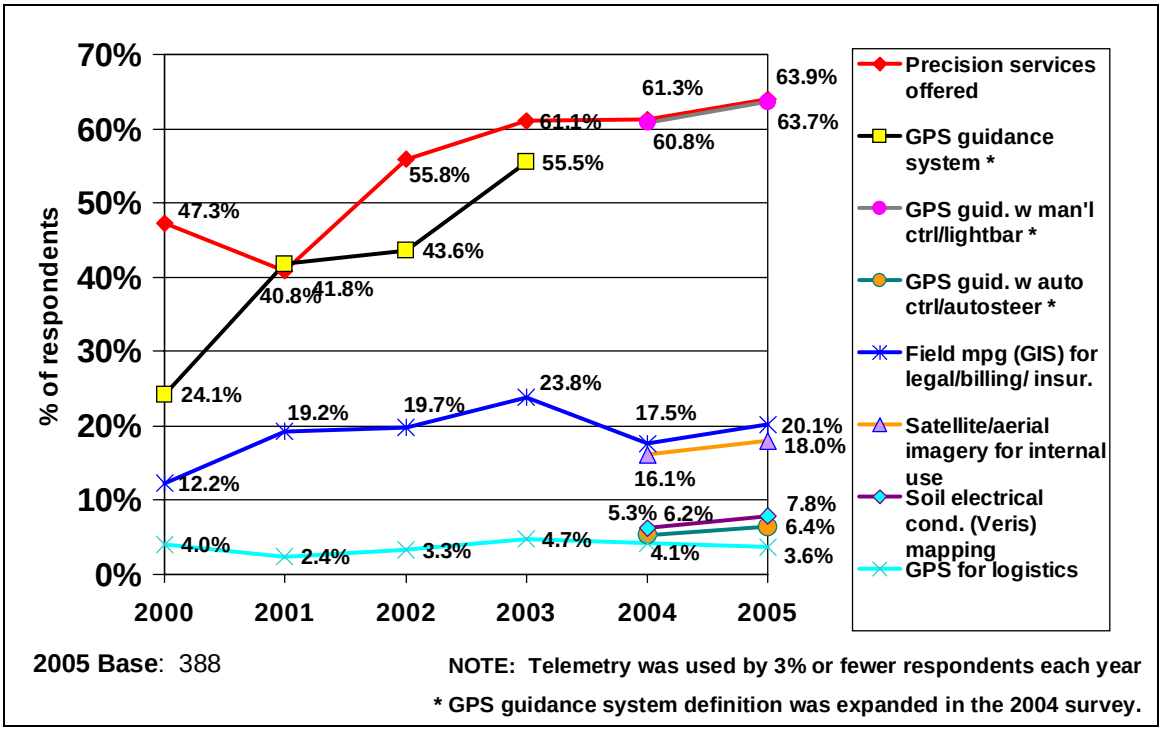
Similar to last year, three-quarters (76 percent) of the respondents used precision technologies in some way in their dealership (Figure 22). The two most common uses were offering precision services to their customers (64 percent of respondents) and using GPS guidance with manual control/lightbar (also 64 percent of respondents). The next two most common uses were field mapping with GIS (Geographical Information Systems) and satellite/aerial photography for internal uses (20 and 18 percent of respondents, respectively). Fewer than 10 percent of the respondents said they used soil electrical conductivity mapping (Veris), GPS guidance systems with auto control/auto steer, GPS for logistics, and telemetry for field to home office information.

Figure 22. Use of Precision Technology



Some uses of precision technology have increased while others have remained fairly Figure 23) stable over time. The biggest growth has been in precision service offerings, with fairly consistent growth from 2000 to 2005. Field mapping (GIS) for legal/billing/insurance purposes has moved in the 12 to 24 percent range while GPS used for logistics has been fairly constant, hovering just below 5 percent. Some of the specific uses were fine-tuned in 2004's survey and therefore there is no history of use before last year.

Figure 23. Use of Precision Technology over Time



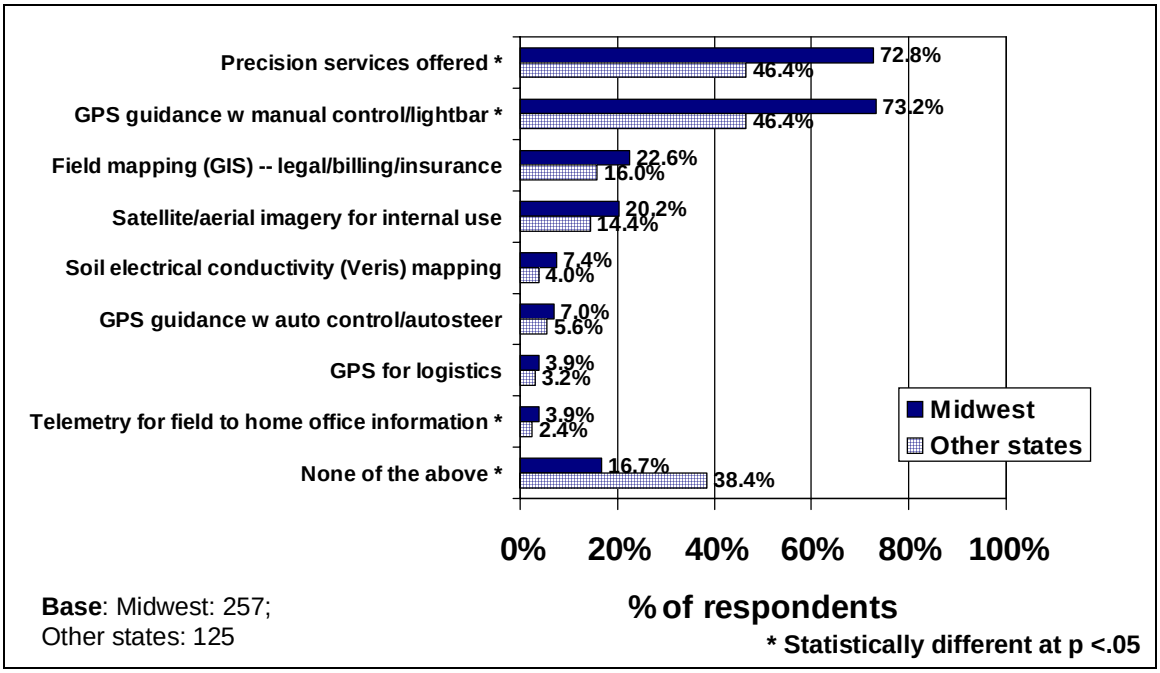
2005 Base: 388

NOTE: Telemetry was used by 3% or fewer respondents each year

*** GPS guidance system definition was expanded in the 2004 survey.**

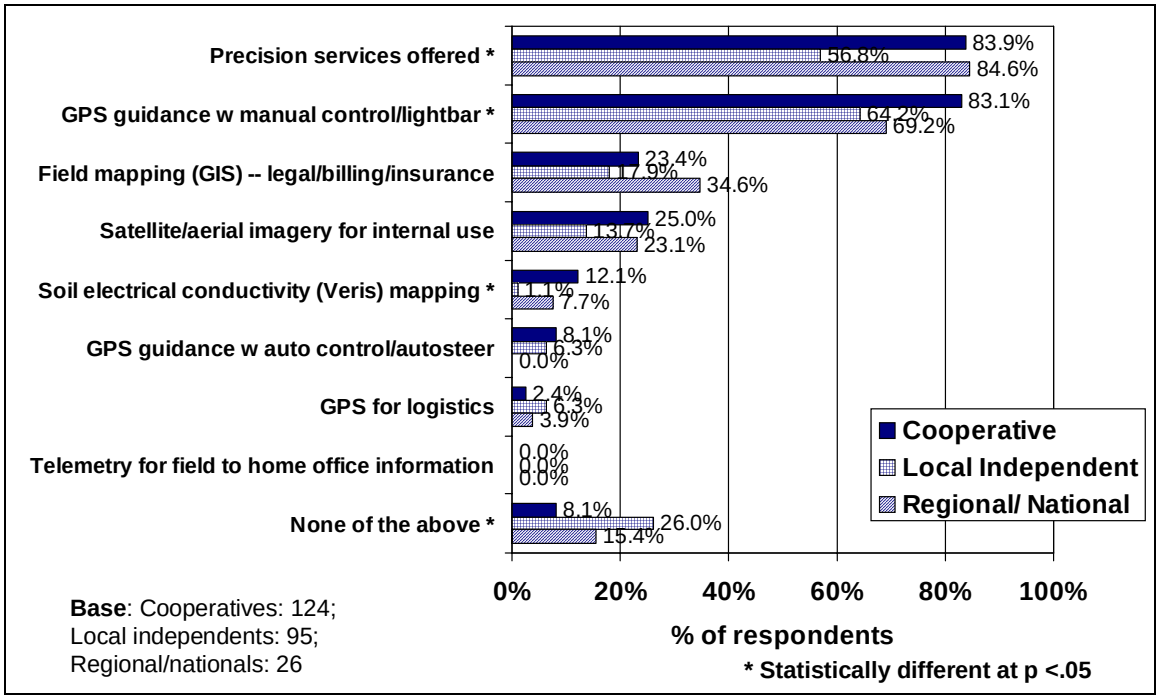
As in other years, precision technologies were being used by significantly more dealerships in the Midwest than in non-Midwestern states (Figure 24). More than 8 out of 10 of the respondents in the Midwest (83 percent) said their dealership used precision technologies in some way, compared to six out of 10 of the respondents from other states (62 percent). Over two-thirds of the Midwestern respondents said their dealership offered precision services (73 percent) compared to only 46 percent of the non-Midwestern respondents. GPS was used in a guidance system with manual control/lightbar by 73 percent of the Midwestern dealerships compared to 46 percent of the non-Midwestern respondents. There were no statistical differences between regions in the use of field mapping with GIS for internal uses, satellite/aerial photography for internal use, soil electromagnetic mapping, or GPS guidance with autosteer.

Figure 24. Use of Precision Technology by Region



In the Midwest, adoption of precision technology varied by organizational type. Over 9 out of 10 respondents representing cooperative organizations said they used at least one precision technology while 85 percent of those representing regional/nationals used at least one precision technology and only 74 percent of the local independents used at least one. Eighty-five percent of the respondents representing regional/nationals offered precision services to their customers (Figure 25), while almost as many (84 percent) of the cooperatives offered precision services. This can be contrasted to the local independents where only 57 percent of the respondents offered precision services. In general, internal uses of precision technology were also more likely for the larger regional/national organizations and cooperatives than for the local independents, possibly reflecting the greater overall resources available to these firms.

Figure 25. Use of Precision Technology by Organizational Type in the Midwest



Precision Service Offerings

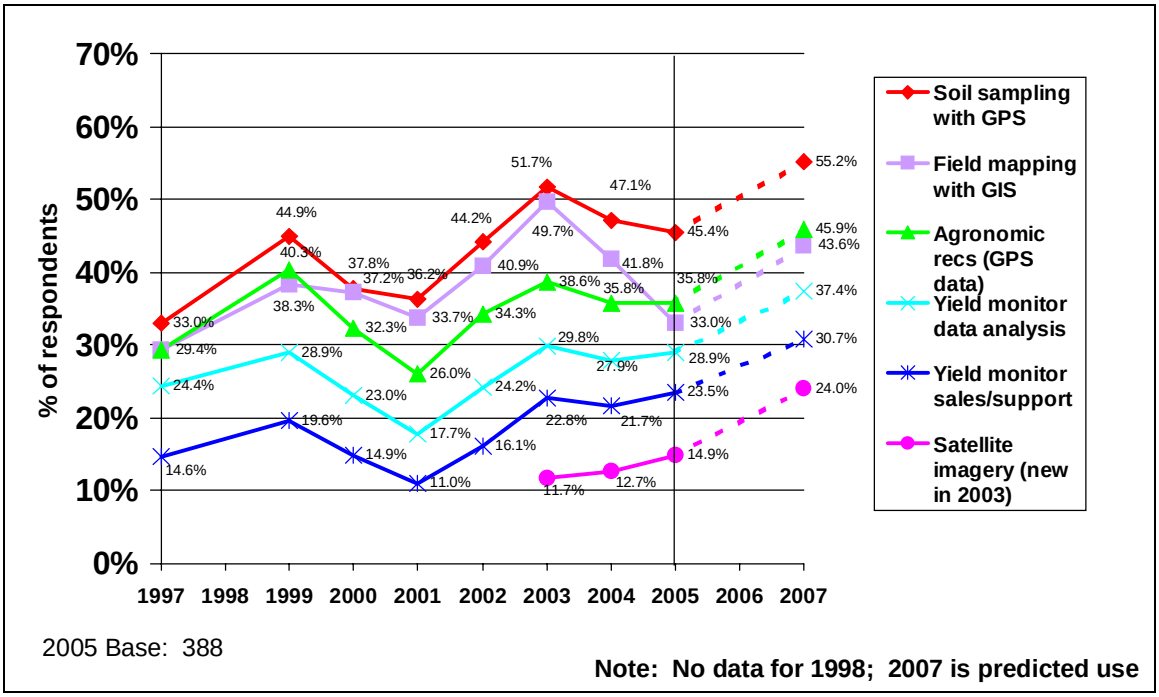
Respondents were asked which specific precision services they would be offering their customers by the fall of 2005. In most cases, 2005 use and projections were similar to those provided last year. The most common precision service offered by these dealerships was soil sampling with GPS – offered by 45 percent of the respondents (Figure 26). This was similar to last year's 47 percent of respondents offering the service. By 2007, 55 percent of the respondents expected their dealerships to be offering soil sampling with GPS.

Traditionally in second place, field mapping with GIS fell to being the third most common precision technology service to be offered, with only 33 percent of the respondents offering the service by the fall of 2005. By 2007, over 44 percent of respondents expected to be offering this service.

Taking second place was the service of offering of agronomic recommendations based on GPS data, offered by 36 percent in 2005. This was down a bit from its peak of 40 percent in 1999 but was expected to be offered by 46 percent of the respondents by 2007.

The remaining precision services changed little from 2004 to 2005. Yield monitor data analysis and yield monitor sales/support both were relatively stable from 2004 to 2005, though future growth was expected. Satellite imagery grew a bit, from 13 percent of respondents offering it in 2004 to 15 percent in 2005. However, use was expected to grow to 24 percent by 2007.

Figure 26. Precision Ag Services Offered Over Time



2005 Base: 388

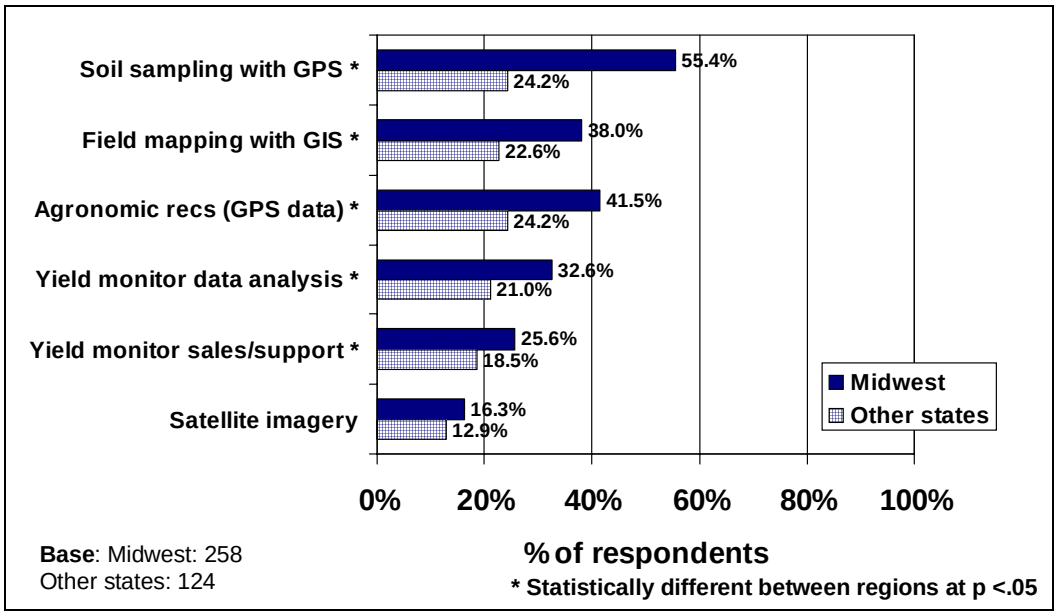
Note: No data for 1998; 2007 is predicted use

With the exception of satellite imagery, all of these precision service offerings were significantly more common in the Midwest than in other states (Figure 27). For example, 55 percent of the responding dealerships from the Midwest indicated they would be offering soil sampling with GPS by the fall 2005. In non-Midwestern states, soil sampling with GPS was expected to be offered by 24 percent of the respondents (similar to last year).

Field mapping with GIS was offered by fewer dealerships this year in both regions, dropping from 50 percent of respondents in 2004 to 38 percent in 2005 in the Midwest. A smaller drop was seen in non-Midwestern states, with 23 percent of the respondents saying their dealership would be offering field mapping with GIS by the fall of 2005, compared to 25 percent last year.

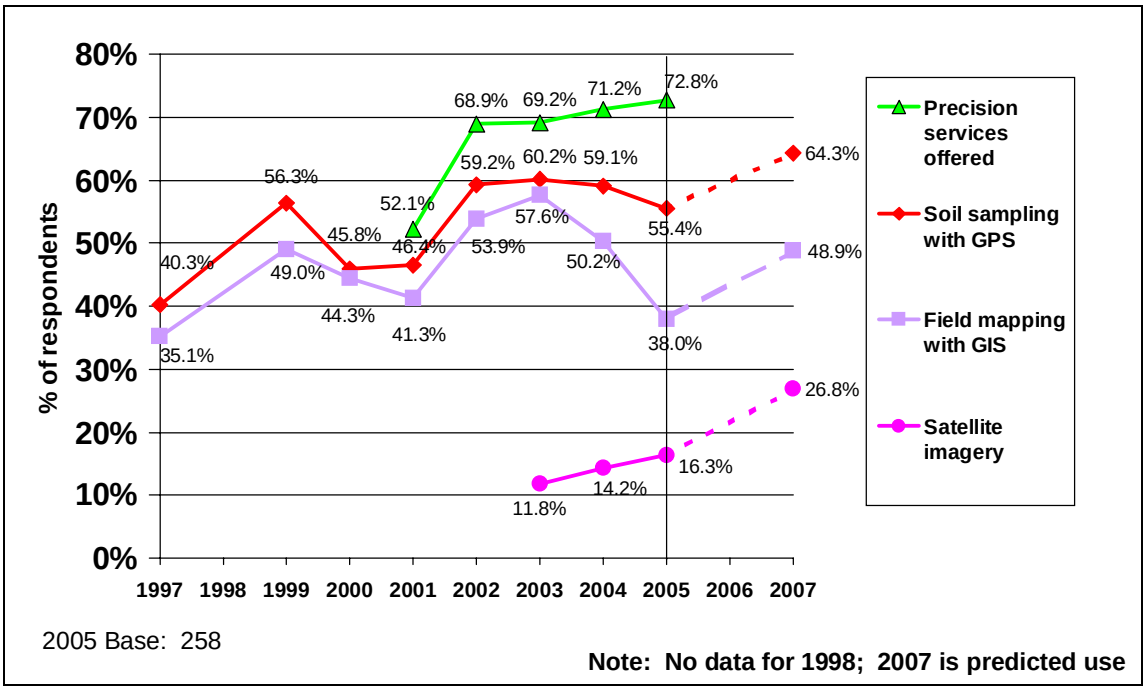
The gap between regions was similar for agronomic recommendations based on GPS data, yield monitor data analysis, and yield monitor sales/support. For most of these services, 50 percent more respondents offered the service in the Midwest compared to respondents from other states.

Figure 27. Precision Ag Services Offered by Region



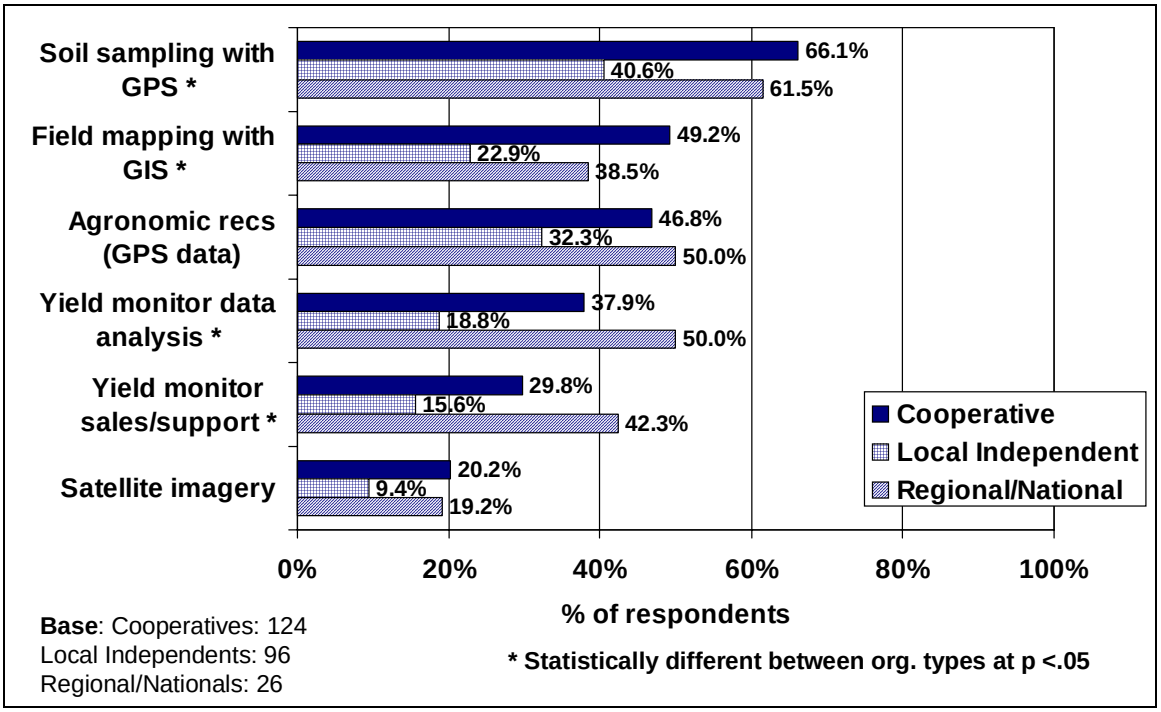
To get a better understanding of precision technology growth in the Midwest, Figure 29 shows the trends in key precision service offerings in the Midwest over the past 10 years. Overall, dealers offering any type of precision service offerings have shown a slow but steady increase since 2002, growing from 69 percent to 73 percent. However, individual services have not shown as much consistency in growth.

Figure 28. Precision Ag Services Offered Over Time in the Midwest



As in previous years, precision service offerings were more extensive in national/regional organizations and cooperatives in the Midwest compared to local independents (Figure 29). In general, in the Midwest, local independents were not as likely to offer these services relative to the other organizational types.

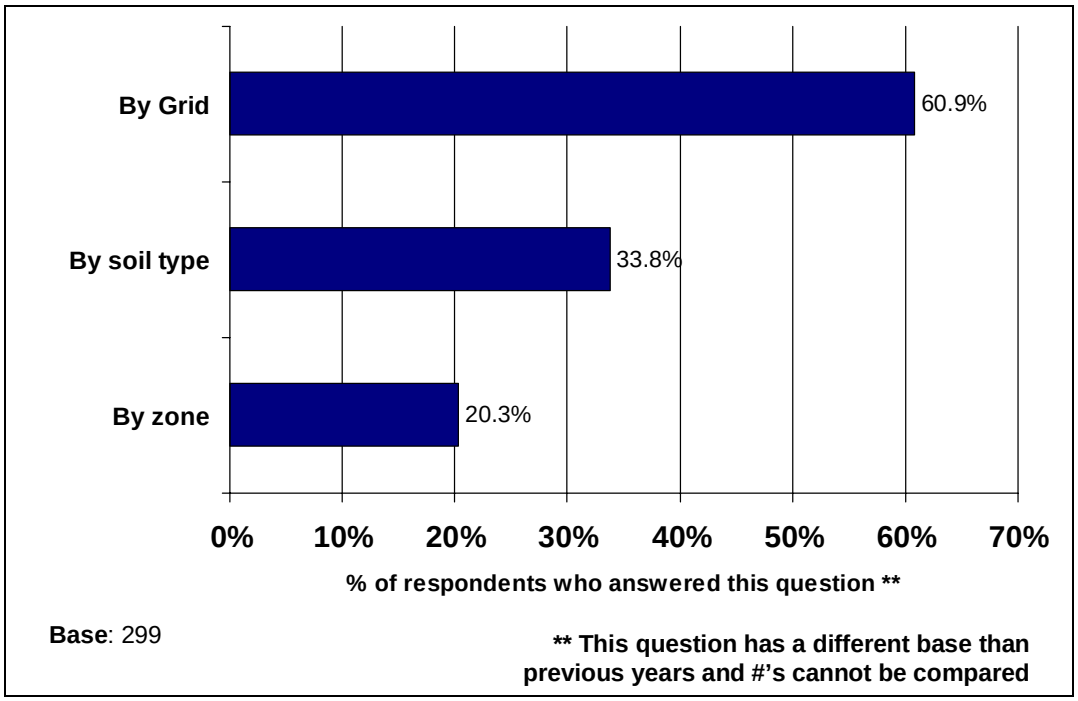
Figure 29. Precision Ag Services Offered by Organizational Type in the Midwest



A Focus on Soil Sampling

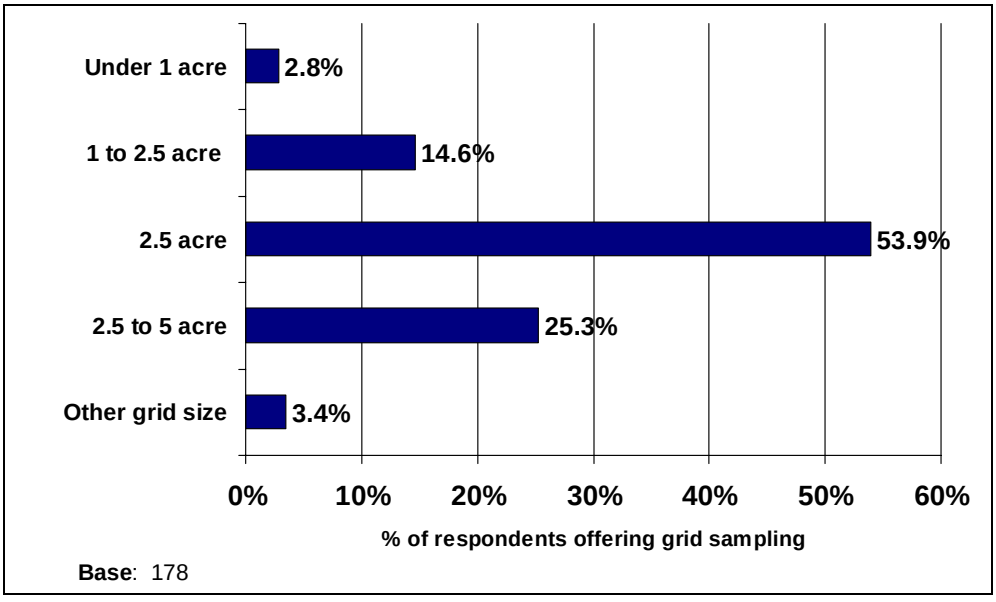
As in previous years, the types of soil sampling dealerships were offering – by grid or by soil type – were explored in more detail. Six out of ten of the respondents who answered this question said their dealership offered soil sampling by grid (Figure 30). (Note that due to differences in wording of the question, these percentages cannot be compared to previous years' data.) A third of the respondents (34 percent) offered soil sampling by soil type, and one in five respondents offered soil sampling by zone.

Figure 30. Types of Soil Sampling Offered



As grid sampling increases in popularity, the distribution of grid sizes has remained fairly constant, with the most common grid continuing to be 2.5 acres, followed by 2.5 to 5.0 acres (Figure 31). This did vary somewhat across regions, with the 2.5 acre grid size being most common in the Midwest (59 percent of respondents), and a wider variety of grid sizes being used in other states.

Figure 31. Grid Sizes Used in Grid Sampling



Variable Rate Seeding

Variable rate seeding continues to be an area where dealerships show less interest relative to other precision services. Less than 10 percent of the responding dealerships offered variable seeding, either with or without GPS in 2005 (Figure 32). There was no statistical difference between regions or by organizational type (Figure 33 and Figure 34).

Figure 32. Variable Rate Seeding Offered Over Time

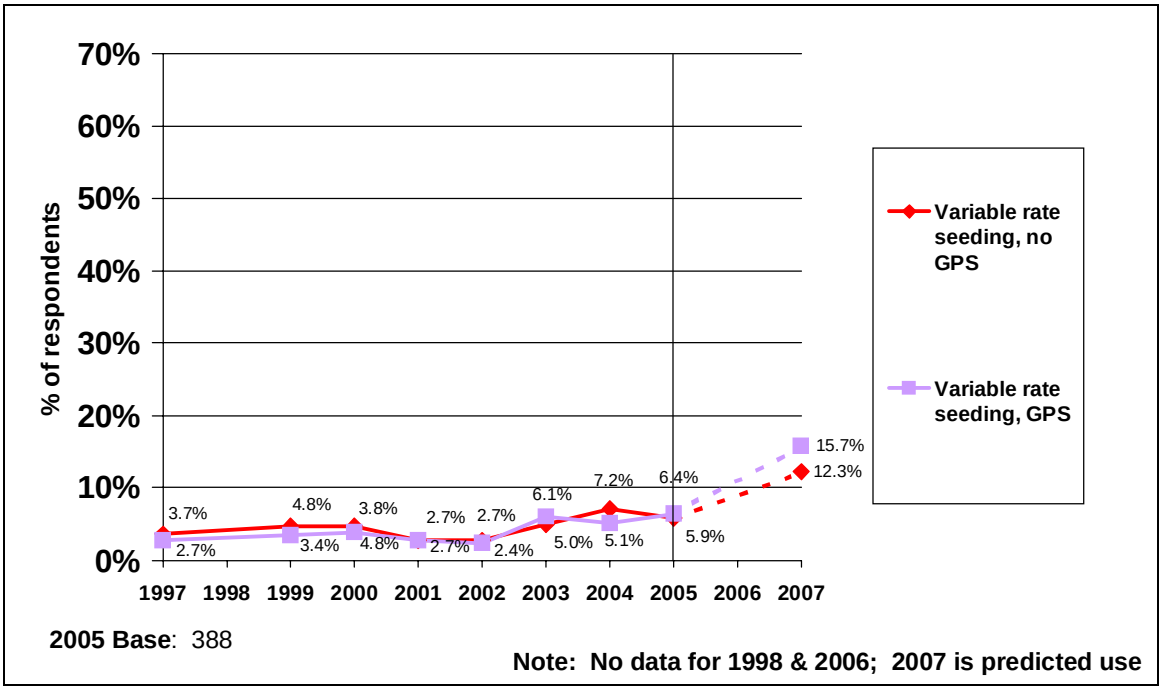


Figure 33. Variable Rate Seeding Offered by Region

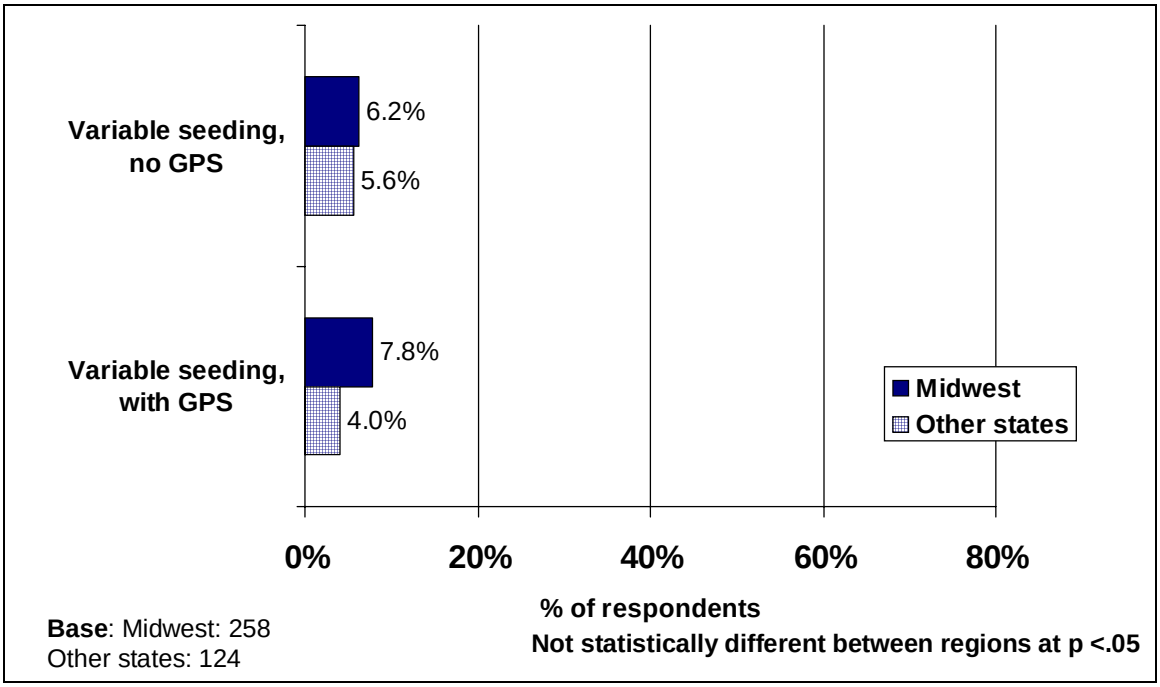
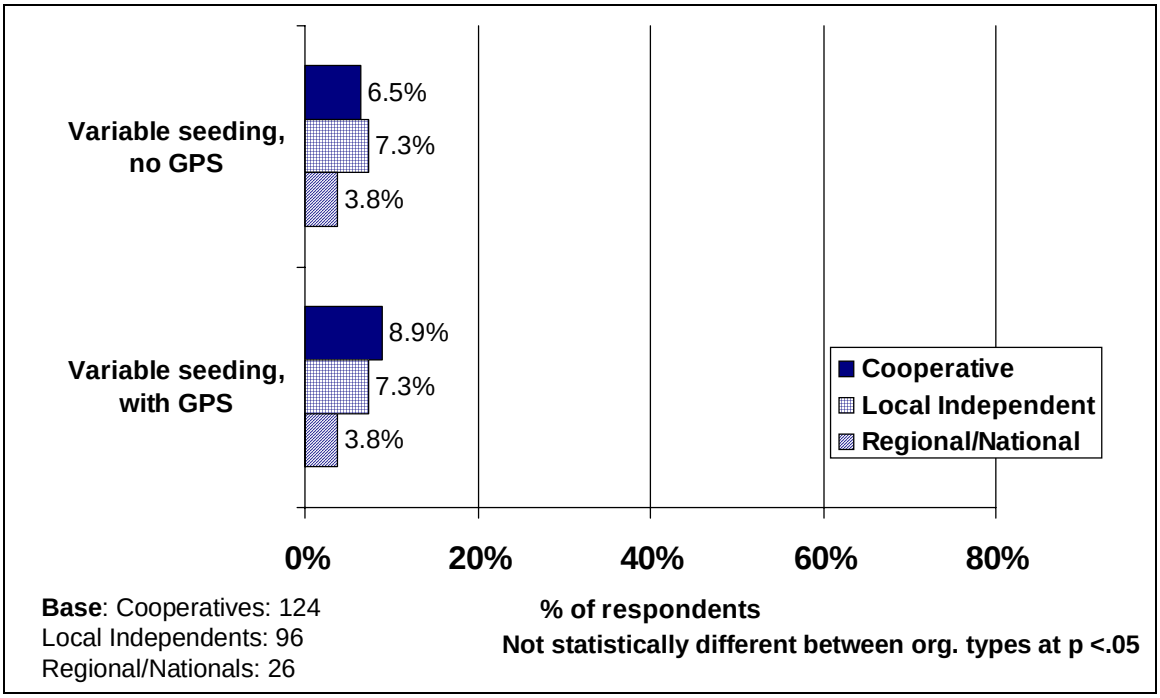


Figure 34. Variable Rate Seeding Offered by Organizational Type in the Midwest

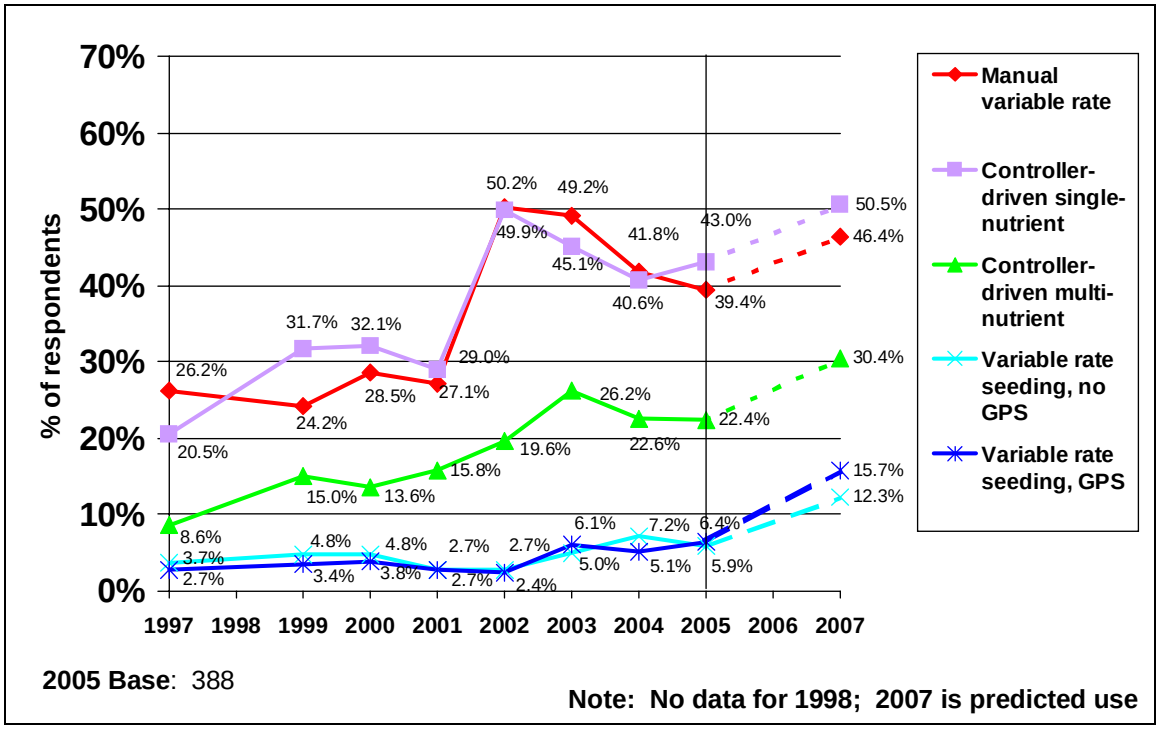


Variable Rate Application

Variable rate custom application services have usually been provided along with traditional custom application services. Of the 84 percent of the dealerships who offered custom application, two-thirds expected to offer some type of variable rate application service by the fall of 2005 (including both controller-driven and manual variable rate application).

Figure 35 shows the trends in variable rate application service offerings over time. Overall, there was not much growth in the adoption of any type of variable rate application. In addition, only modest growth was expected for precision application services in the future.

Figure 35. Precision Application Offered Over Time

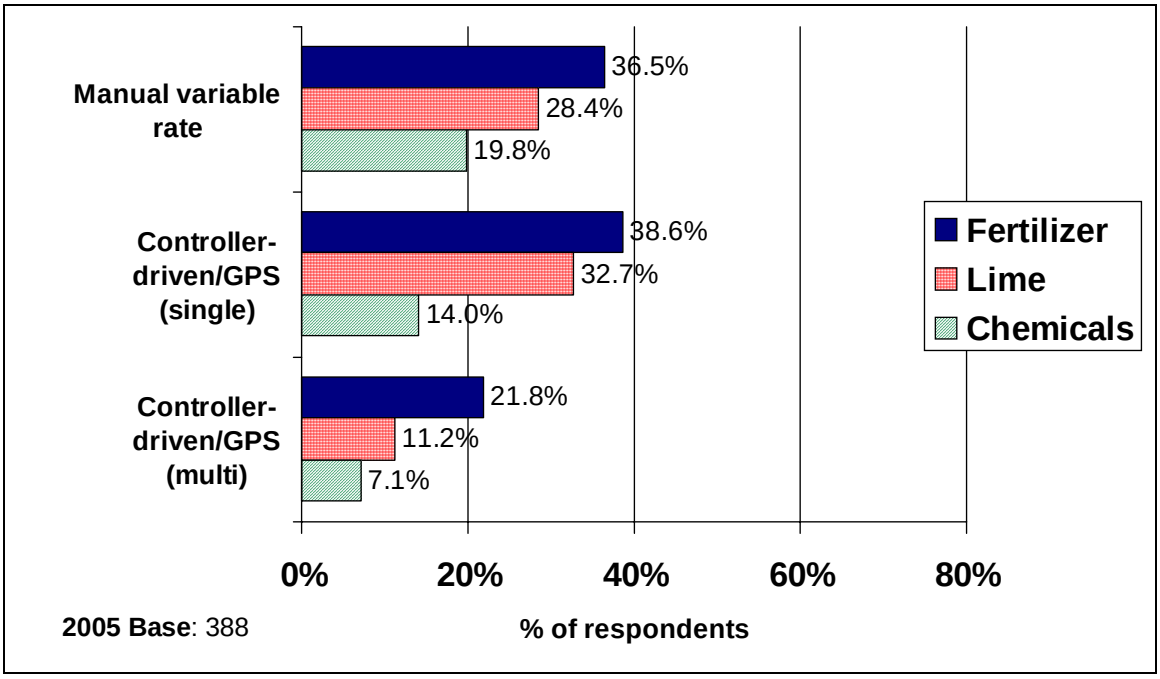


2005 Base: 388

Note: No data for 1998; 2007 is predicted use

Figure 36 shows the offerings of specific controller-driven variable rate application services in 2005. Almost half of the respondents (45 percent) offered some form of controller-driven application of fertilizer, lime and/or chemicals – either single nutrient or multi-nutrient application. Single nutrient controller-driven application of fertilizer was the most common controller-driven variable rate application service offered, with 39 percent of the respondents expecting to offer the service by the fall of 2005. This figure was similar to the 40 percent offering the service in 2004. Multi-nutrient controller-driven application of fertilizer was unchanged from last year, with 22 percent of the responding dealerships offering the service in 2005. Approximately 14 percent of the respondents offered single nutrient, controller-driven variable rate application of chemicals, roughly the same proportion as last year.

Figure 36. Precision Application Offered for Each Input Type



Manual and controller-driven variable rate application was more common in the Midwest relative to the other states (Figure 37 to Figure 39). For fertilizer, just under half of the respondents (48 percent) expected to offer single nutrient controller-driven application in the Midwest by the fall of 2005 compared to only 23 percent of the respondents from other states (Figure 37). Multi-nutrient controller-driven application of fertilizer in both Midwestern and non-Midwestern states were almost the same in 2005 as in 2004. In the Midwest, multi-nutrient controller-driven application of fertilizer was offered by 28 percent of the respondents while 12 percent of the respondents from non-Midwestern states expected to offer the service by fall 2005.

Controller-driven application of lime was offered at slightly lower levels than fertilizer in both regions (Figure 38). For chemicals, variable rate application was not as common as for fertilizer and lime (Figure 39), though the gap was less in non-Midwestern states than in the Midwest. There were no statistical differences across regions for variable rate chemical application.

Figure 37. Precision Application of *Fertilizer* Offered by Region

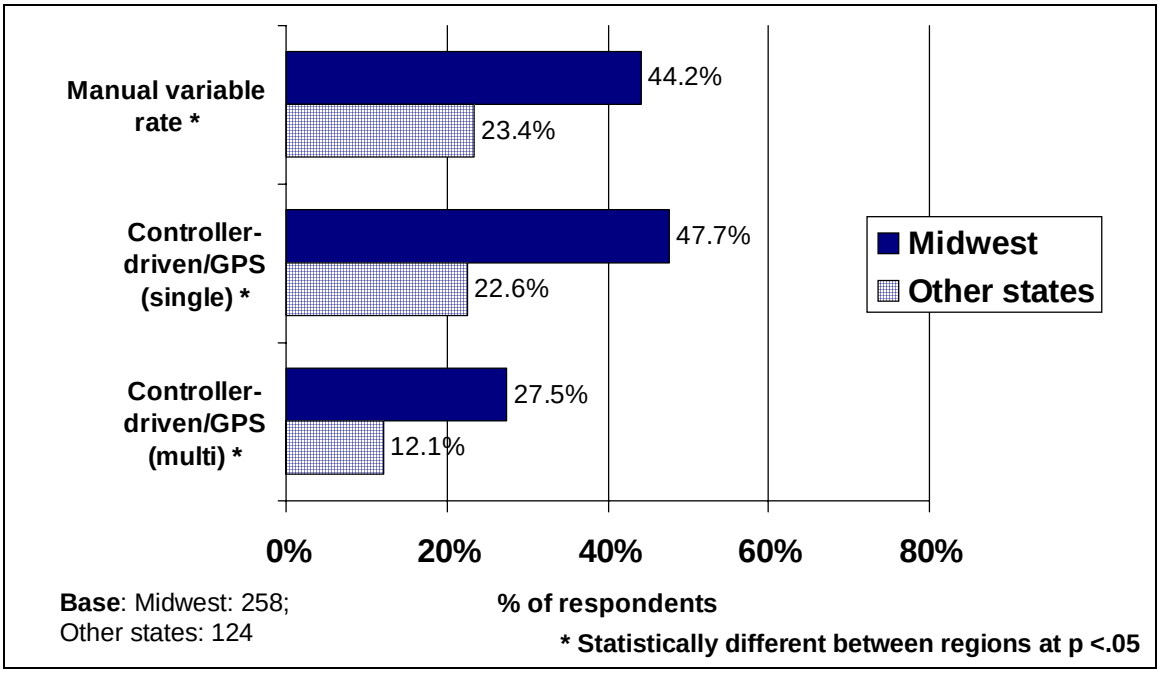


Figure 38. Precision Application of *Lime* Offered by Region

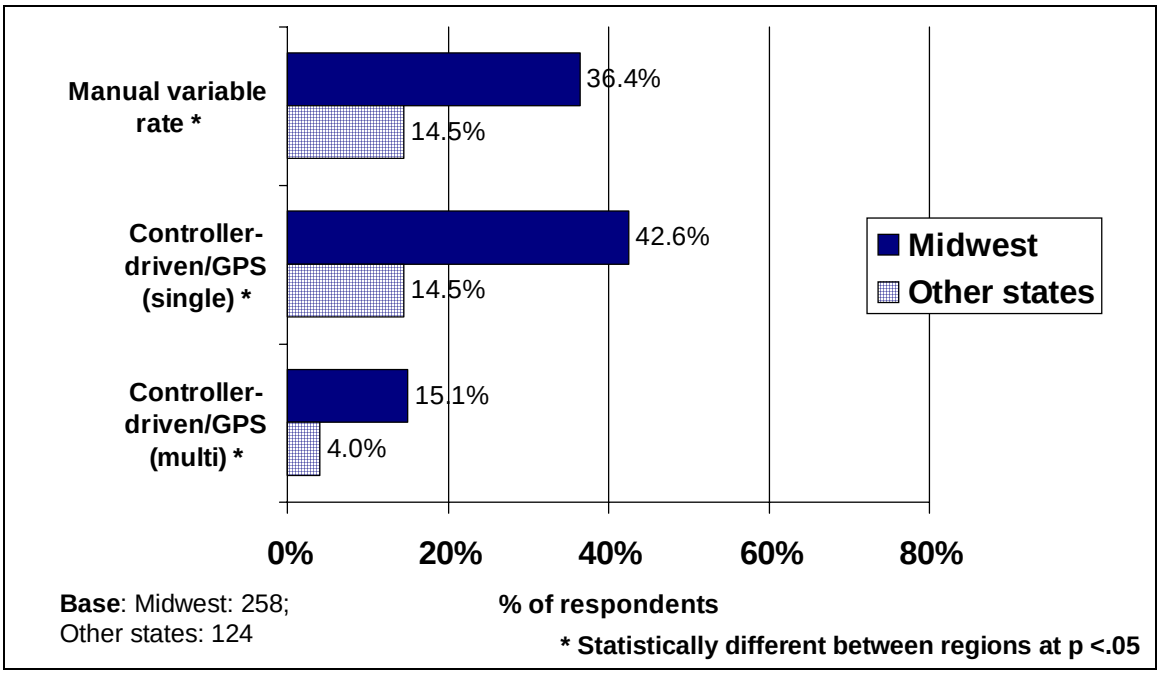
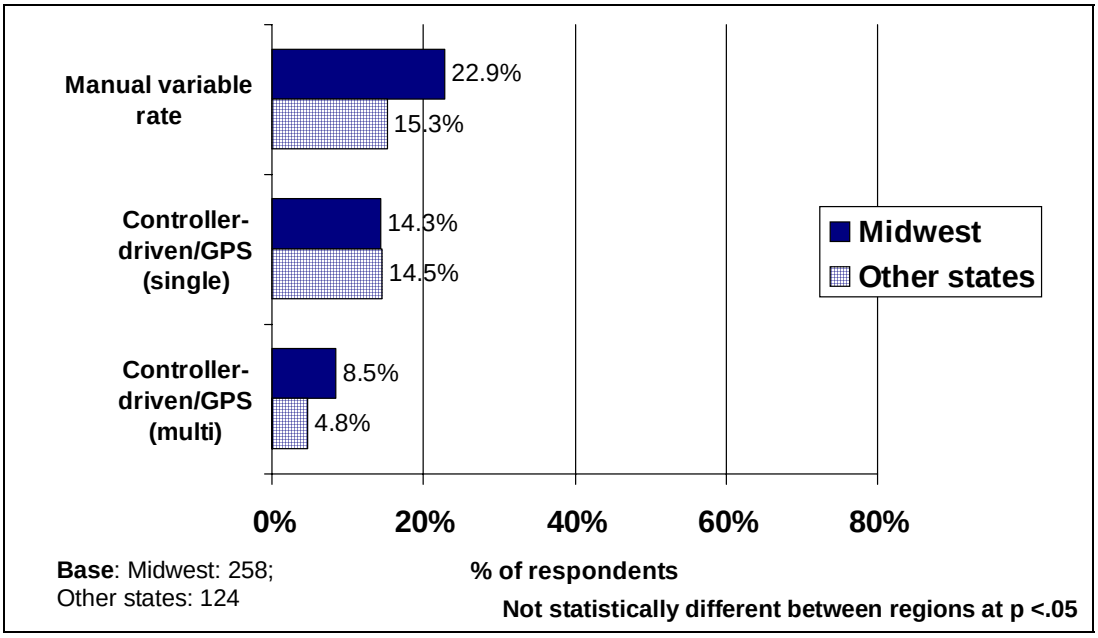


Figure 39. Precision Application of *Chemicals* Offered by Region



To give a perspective of overall adoption of controller-driven application in the Midwest, Figure 40 shows the level of variable application over the past 10 years. Both single-nutrient and multi-nutrient controller-driven application have grown steadily in those years, with reported offerings declining in only a few years.

Figure 40. Variable Rate Application Offered Over Time in the Midwest

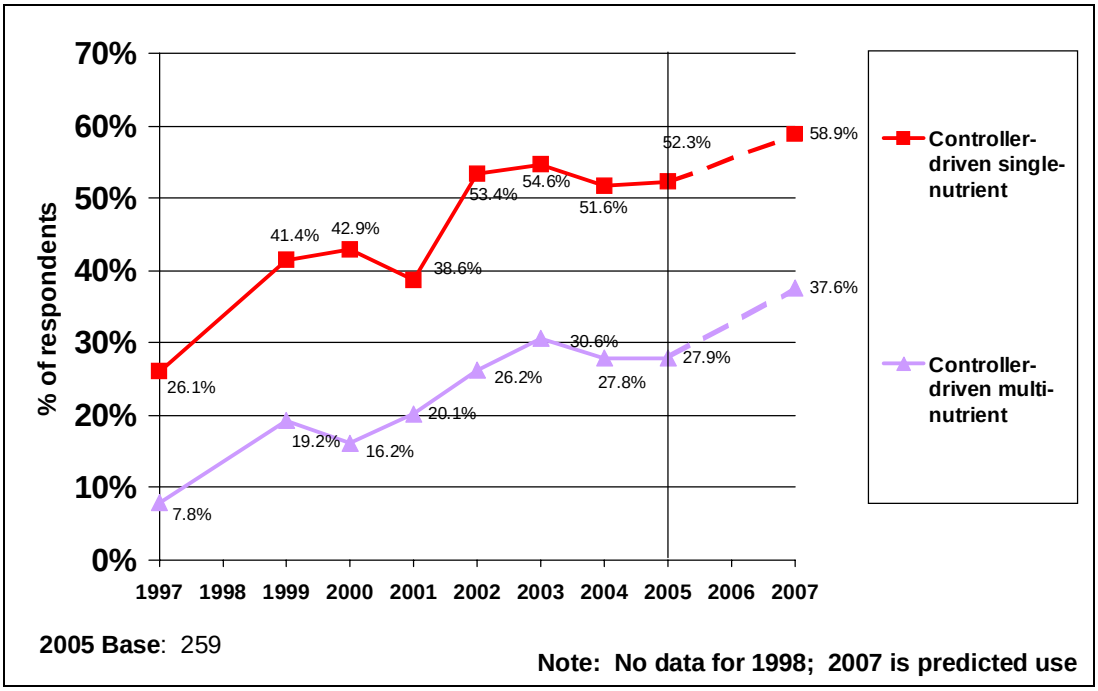


Figure 41 to Figure 43 show the precision application offerings by organizational type in the Midwest. In general, the patterns are similar to those seen for other services, with regional/national outlets and cooperatives being more likely to offer precision application than local independents, though there were no significant differences between organizational types in their offerings of manual variable rate application. The largest differences were seen for controller-driven multi-nutrient application, with 3 to 4 times as many cooperatives and regional/national organizations offering the service as compared to the local independents. This may reflect the higher cost of equipment and additional expertise involved.

Figure 41. Precision Application of *Fertilizer* Offered by Organizational Type in the Midwest

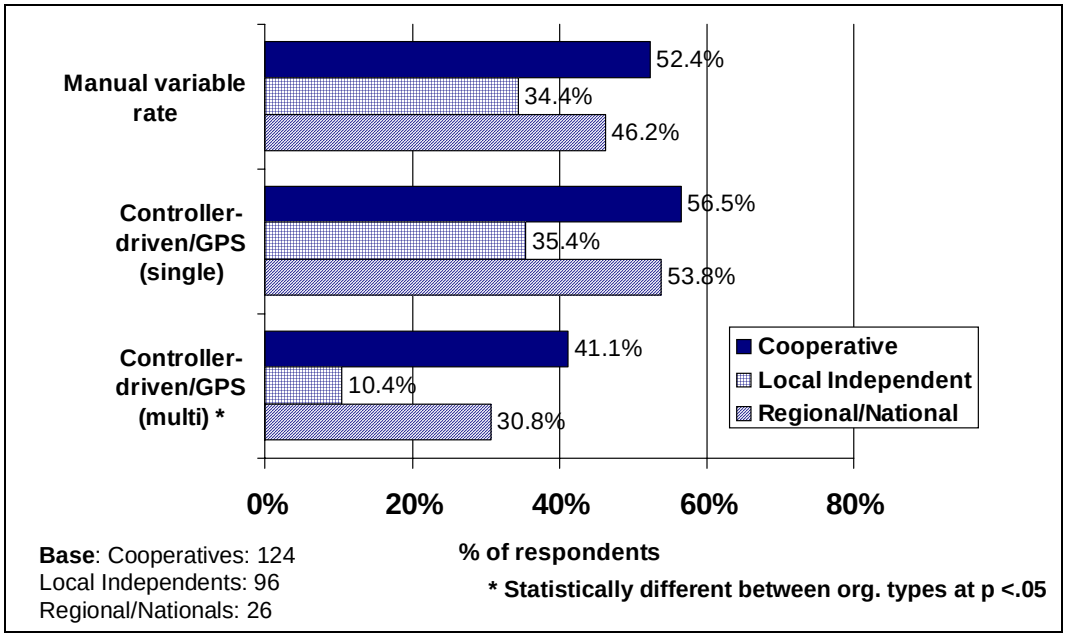


Figure 42. Precision Application of *Lime* Offered by Organizational Type in the Midwest

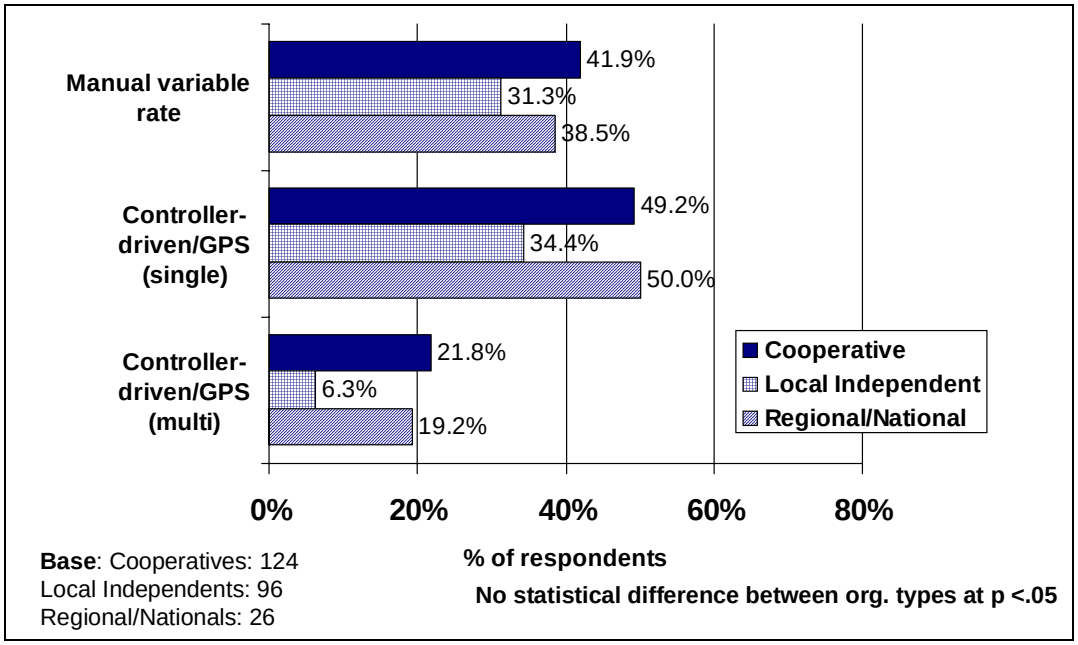
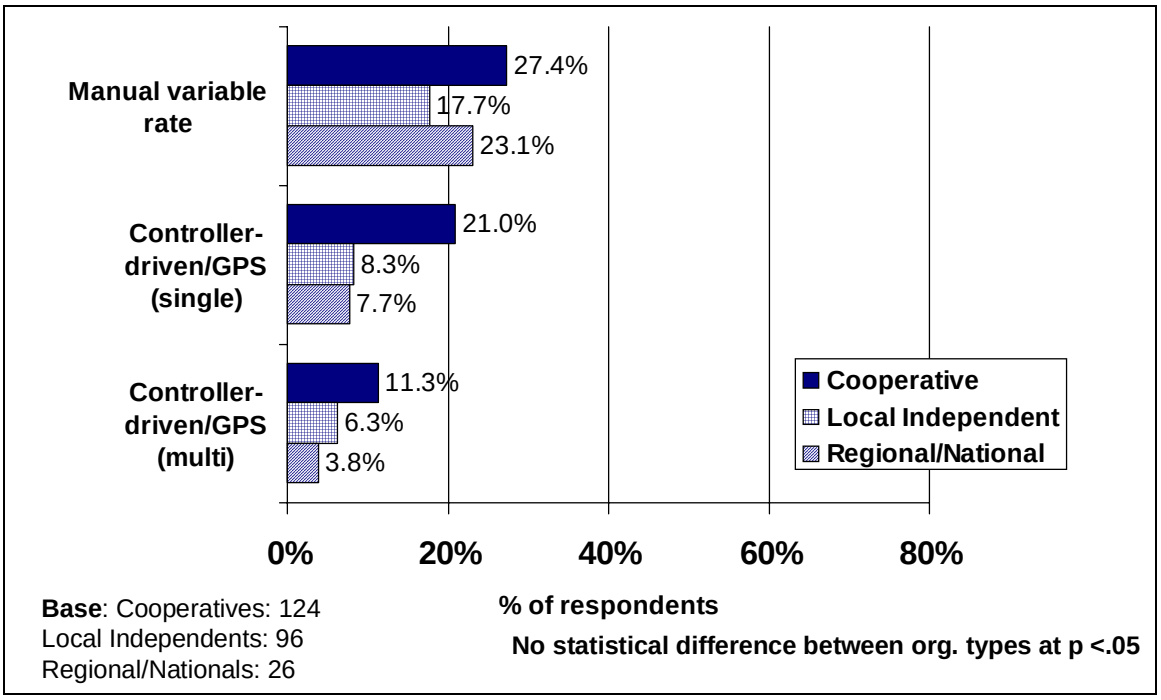


Figure 43. Precision Application of *Chemicals* Offered by Organizational Type in the Midwest



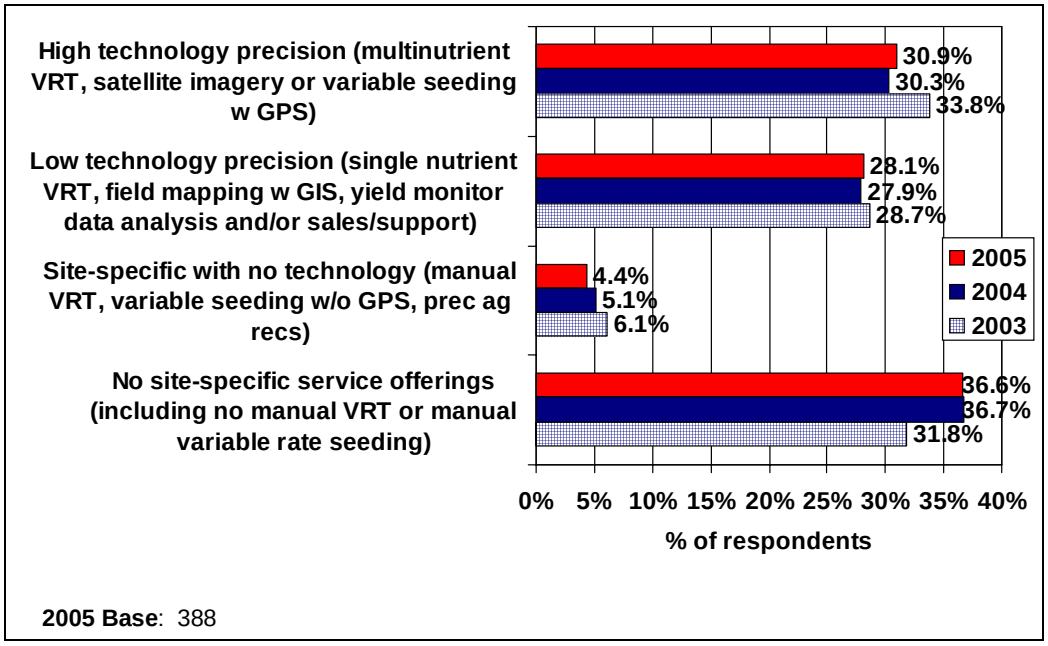
Levels of Precision Adoption

To summarize how extensively dealerships are incorporating precision technology into their service offerings, respondents were grouped into the following categories based on how extensive their precision service offerings were:

1. "High tech": Multi-nutrient variable rate application, satellite imagery and/or variable seeding with GPS
2. "Low tech": Single variable rate application, field mapping with GIS, yield monitor sales/support and/or data analysis, soil sampling with GPS
3. "Site-specific with no technology": Manual variable rate application, variable rate seeding with no GPS, and/or agronomic recommendations based on precision data gathered elsewhere
4. No site-specific services at all.

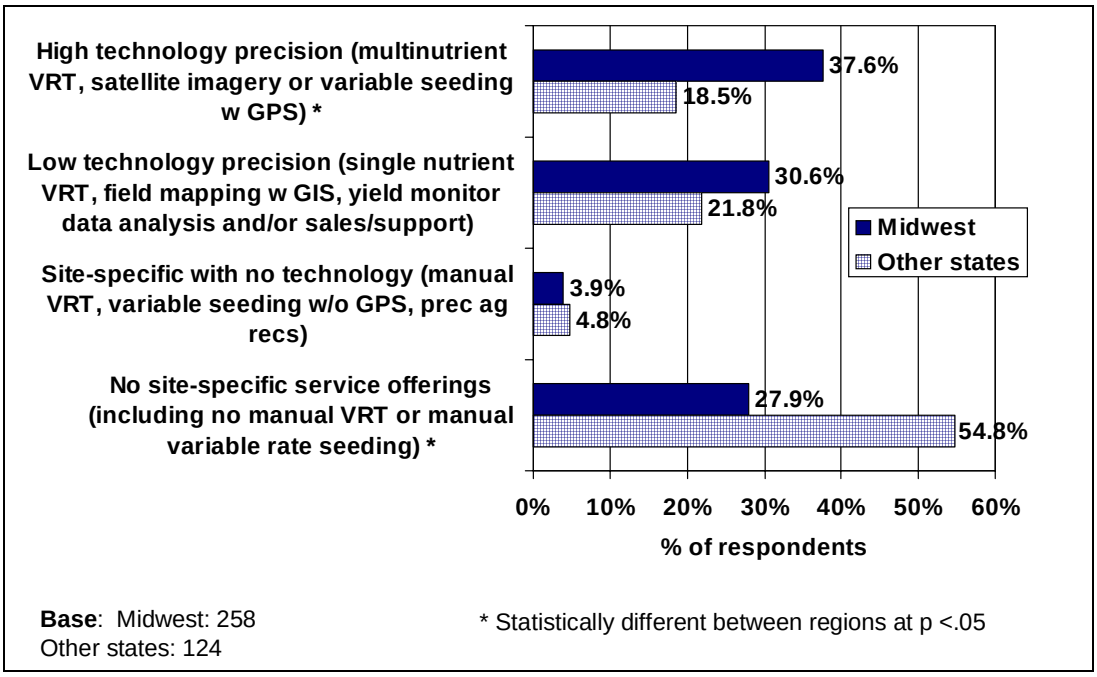
Just under a third of the respondents were in the "high tech" category (Figure 44), just under a third were in the "low tech" category and over a third offered no site-specific services at all (including manual variable rate application or making recommendations based on precision data). Very few respondents were offering manually-controlled site-specific services with no technology investment. These numbers were virtually unchanged from 2004 results.

Figure 44. Levels of Precision Adoption



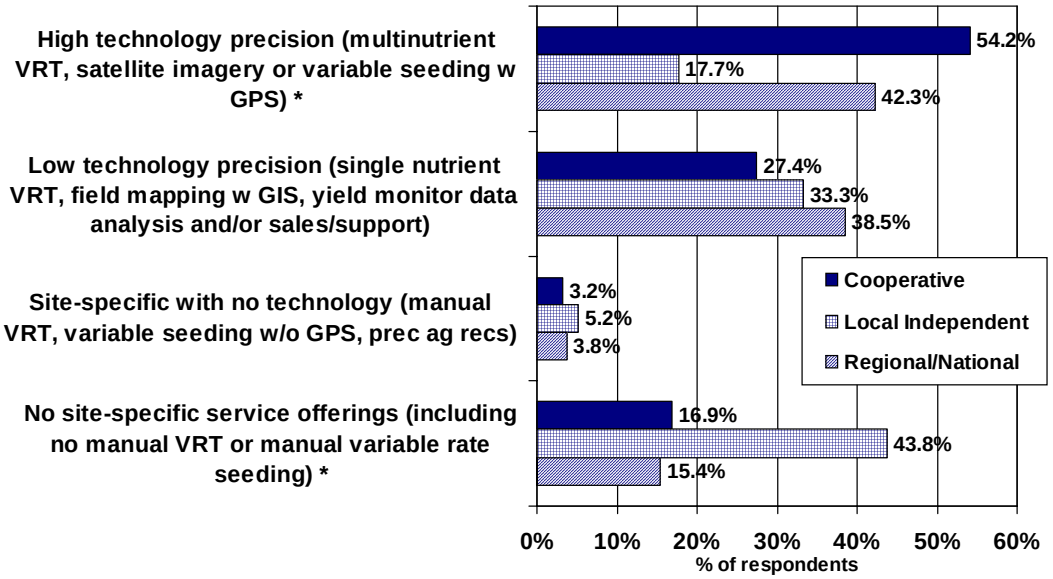
By region, almost four in 10 (38 percent) of the respondents from the Midwest were "High tech" precision users compared to only 19 percent in the non-Midwestern states (Figure 45). Over half of the respondents from the non-Midwestern states offered no site-specific services at all, compared to only 28 percent of the respondents from the Midwest.

Figure 45. Levels of Precision Adoption by Region



In the Midwest, there were significant differences in levels of precision technology between the different types of organizational types (Figure 46). Over half of the respondents from cooperatives (54 percent) were "High tech" precision users compared to 42 percent of the respondents from regional/national organizations. In contrast, only 18 percent of the respondents from local independents were categorized as being "High tech."

Figure 46. Levels of Precision Adoption by Organizational Type in the Midwest



Base: Cooperatives: 124
Local Independents: 96
Regional/Nationals: 26

* Statistically different between org. types at p <.05

Pricing Site-Specific Services

Each year less variation has been reported in the prices charged for precision services from dealership to dealership and market to market. Variation occurs because of differences in customer willingness to pay (often because of the market and/or environmental conditions), competitive price pressure, differences in dealership pricing strategies, and uncertainty about the actual cost of providing the service. Though the price variation is shrinking as the services become more familiar to both dealerships and their customers, variation is still fairly large.

Dealerships were asked to report the typical price they charge per acre for their precision services where they could. For those offering only packages or bundled pricing, it often wasn't possible to price out the components individually. Hence, far fewer respondents completed this question relative to some of the other questions in the survey.

Figure 47 and Figure 48 show the average prices charged per acre for each of the precision services. The bars indicate what the middle 80 percent of the dealers were charging (as with other years, the top 10 percent and bottom 10 percent were dropped to make the ranges a bit more consistent). Overall, the average prices charged were similar to or slightly lower than those seen in previous years. There were no overall differences between prices charged in the Midwest and in other states.

Figure 47. Prices Charged for Precision Ag Services

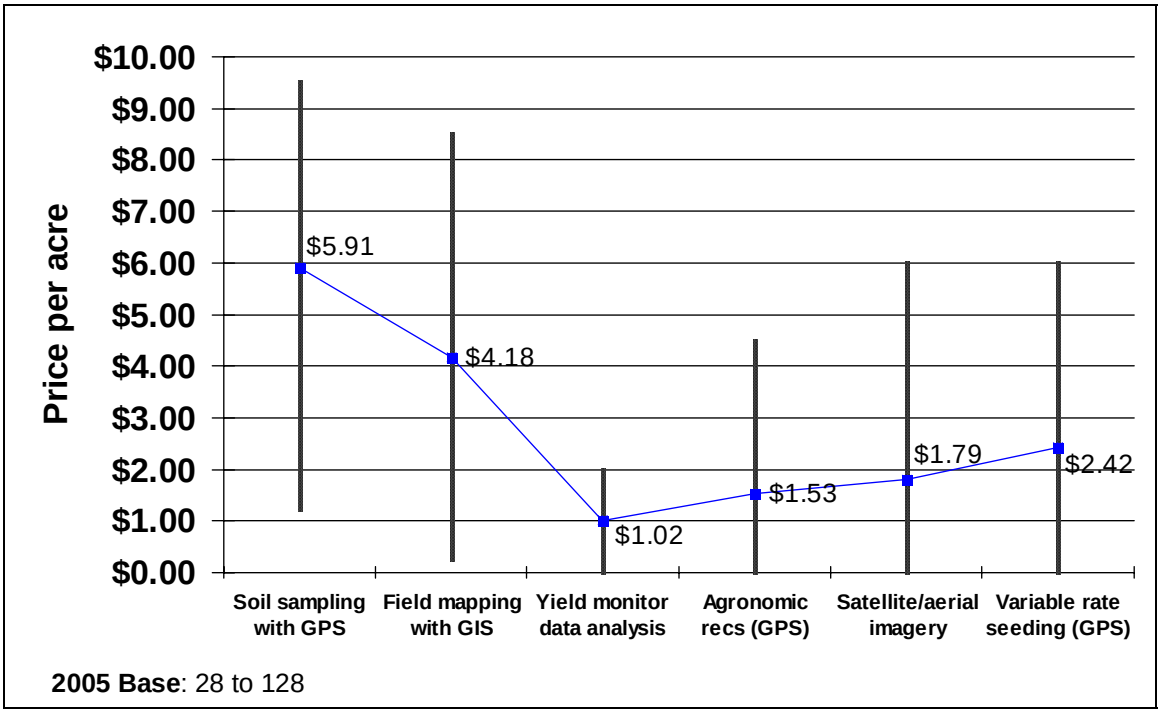
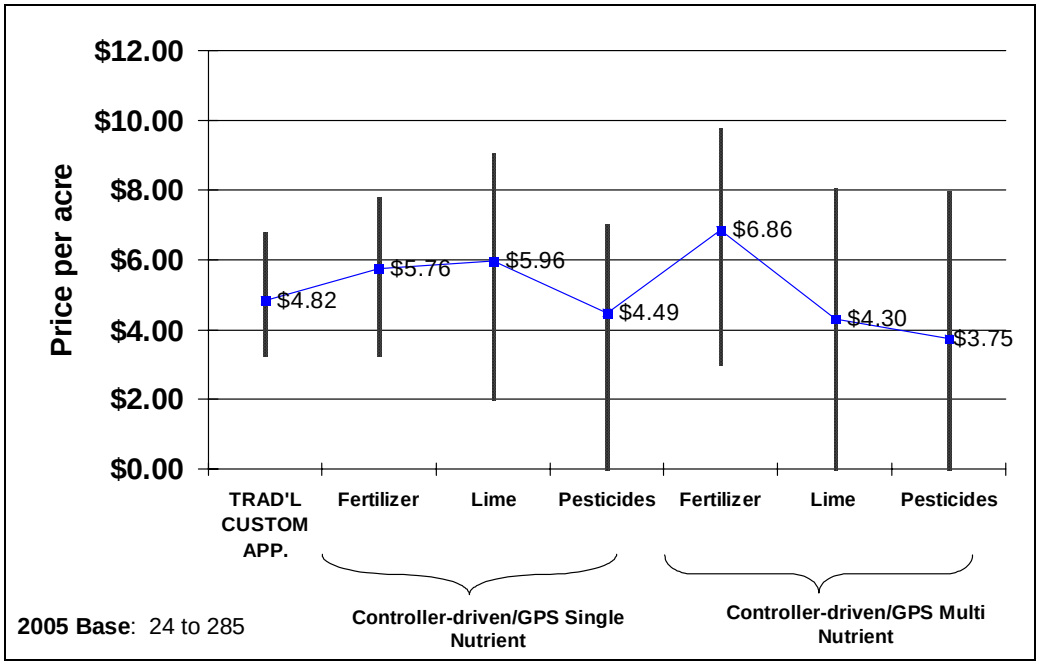
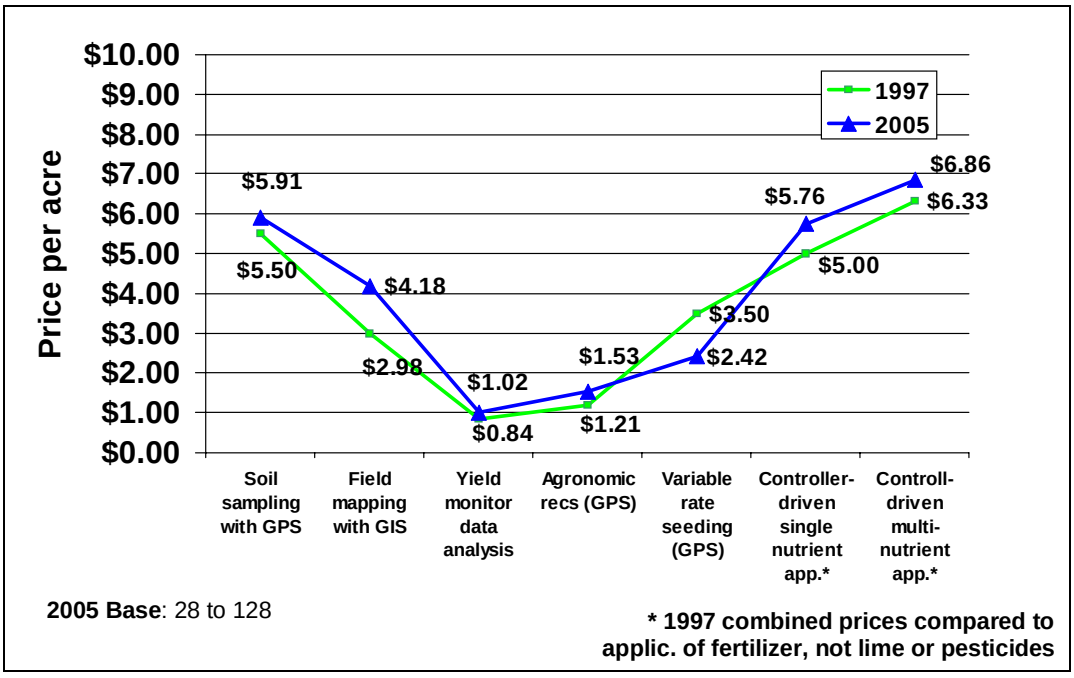


Figure 48. Prices Charged for Precision Application Services



In comparing 2005 prices to those of 1997, though the range in prices has decreased, surprising little change has occurred in average prices each year (Figure 49). The biggest difference was seen in an increase in the cost of field mapping with GIS (from $2.98 per acre to $4.18 per acre). The biggest decrease in prices was in variable rate seeding with GPS which fell from $3.50 to $2.42 per acre, on average.

Figure 49. Prices Charged for Precision Ag Services: Change in 10 Years



Profitability of Precision Service Offerings

Dealerships were asked how profitable they felt their precision offerings were. Compared to last year, dealers seemed to have a better feel for the profitability of their precision service offerings; however, fewer dealerships reported that the precision services were profitable for their business compared to 2004.

Each bar in Figure 50 and Figure 51 shows the proportion of respondents who indicated that a particular service was:

- not covering fixed or variable costs;
- covering variable costs;
- covering both variable and fixed costs; and
- generating a profit.

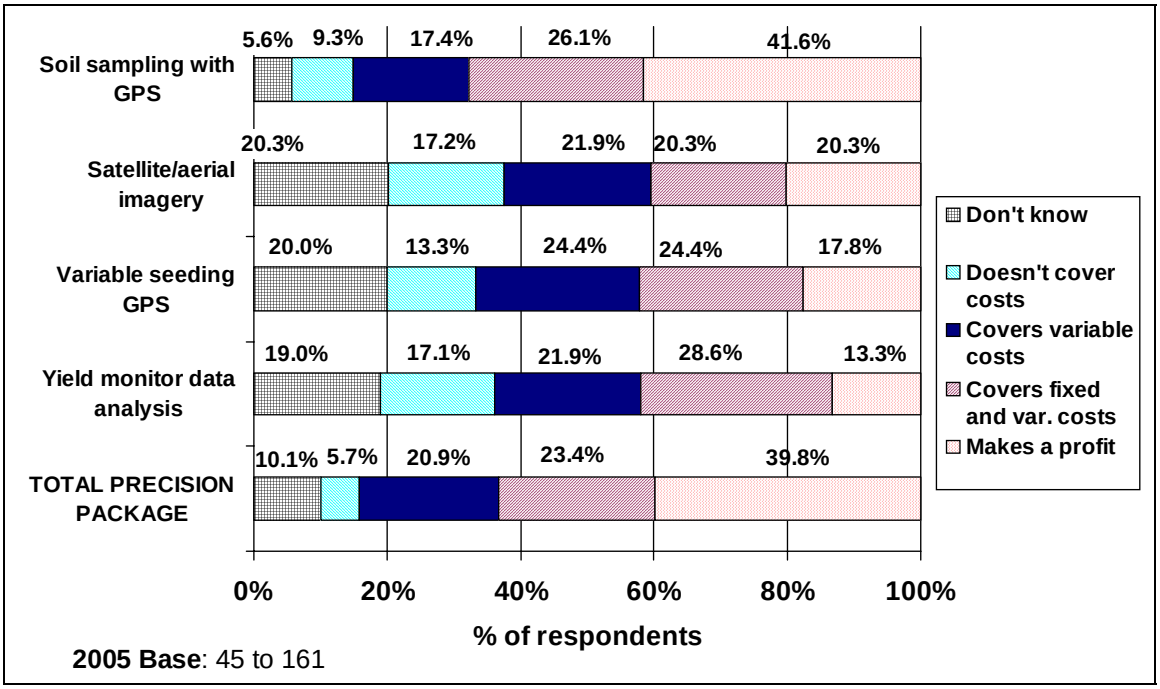
Using soil sampling with GPS in Figure 50 as an example, four out of 10 of the respondents said the service generated a profit for their dealership (42 percent). Just over a quarter (26 percent) said that it just covered fixed and variable costs. One in 6 respondents (17 percent) felt that they were covering variable costs but not fixed costs for soil sampling with GPS and 9 percent said they were covering neither variable nor fixed costs. Only 6 percent of the respondents did not know how profitable soil sampling with GPS was for them.

In looking at the precision services in both charts, the most profitable service appeared to be multi-nutrient controller-driven application, unlike last year when soil sampling with GPS was the most profitable precision service. Forty-three (43) percent of the respondents who offered multi-nutrient controller-driven application said that it was generating a profit compared to only 33 percent in 2004. Almost as many respondents (42 percent) said that soil sampling with GPS generated a profit or that traditional custom application generated a profit, though neither service showed much change from 2004 to 2005.

Similar to last year, the least profitable of the precision services considered were variable seeding with GPS and yield monitor data analysis, with only 4 out of 10 dealerships offering the services saying they at least covered fixed and variable costs. Respondents were most uncertain about the profitability of variable seeding with GPS and satellite imagery (though these results were based on few responses).

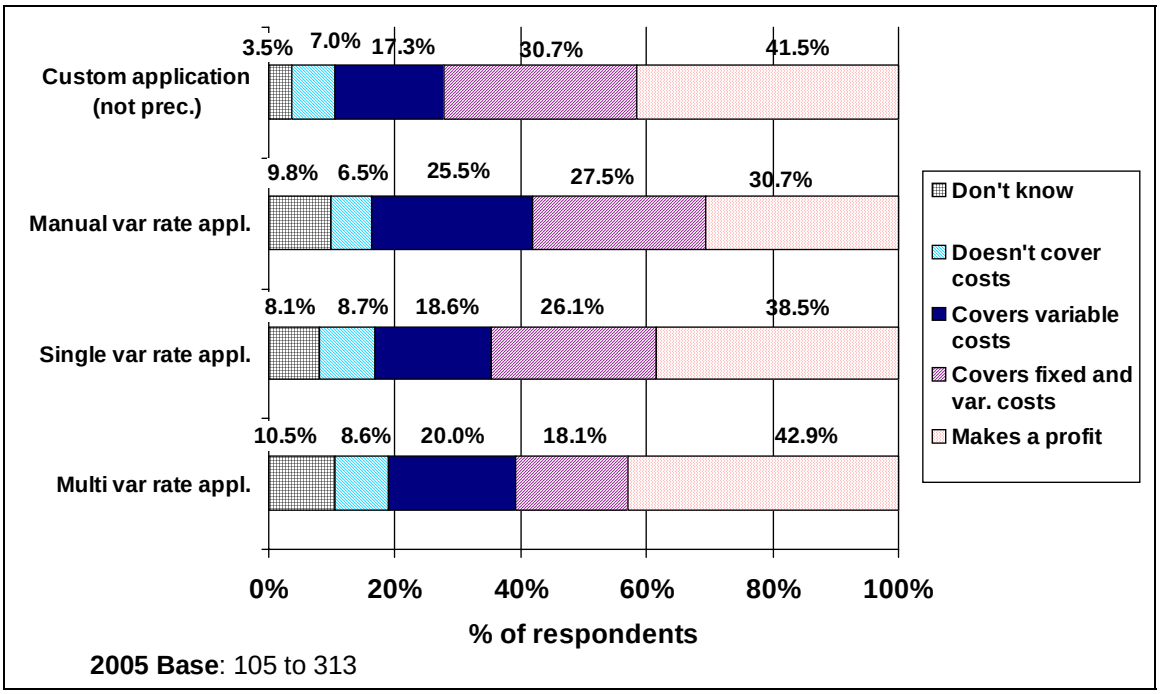
Overall, respondents were confident about the profitability of their total precision service offerings. Four out of ten of the respondents indicated their precision package generated a profit while another 23 percent said they were covering both the fixed and variable costs of providing the services. The perception of the profitability of the different precision service offerings did not vary across regions or across organizational types in the Midwest.

Figure 50. Profitability of Precision Service Offerings



2005 Base: 45 to 161

Figure 51. Profitability of Precision Application Offerings



2005 Base: 105 to 313

Figure 52 shows the profitability of the services across time, with the percentage showing those respondents reporting a profit on the service. Numbers were fairly consistent from 2003 to 2005, though this year showed a decline in profitability of satellite imagery, variable seeding with GPS and yield monitor data analysis.

To get a better perspective of the profitability trends in the Midwest, Figure 53 shows the same trends broken down just for the respondents from the Midwest. After a dip in 2004, multi-nutrient controller-driven application once again was the most profitable precision service, with 47 percent of the respondents saying they were generating a profit with the service. The other services showed a similar profit pattern to that of the entire sample shown in Figure 52.

Figure 52. Respondents Generating a Profit from Precision Services

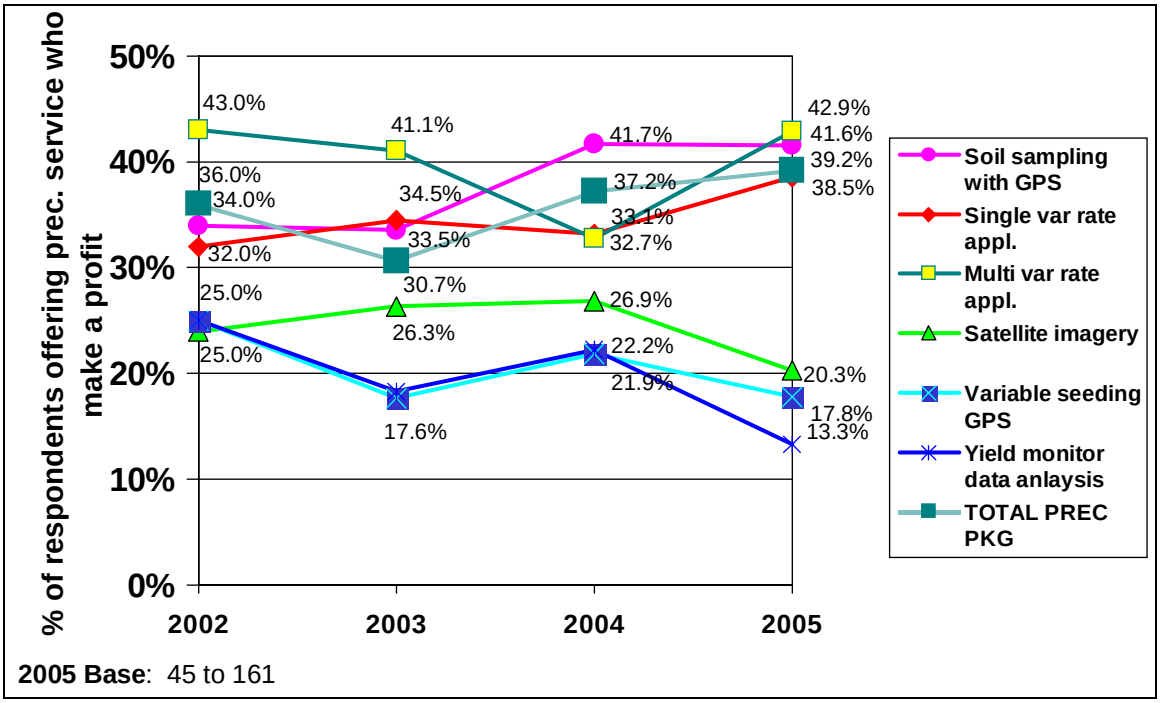
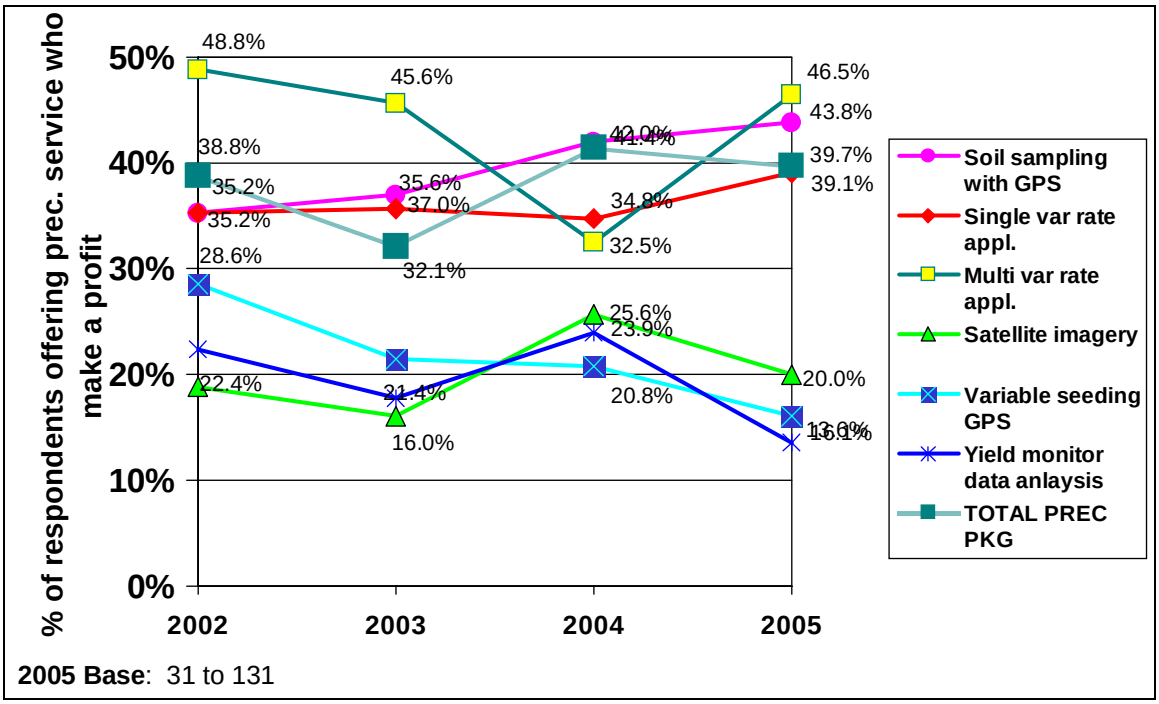


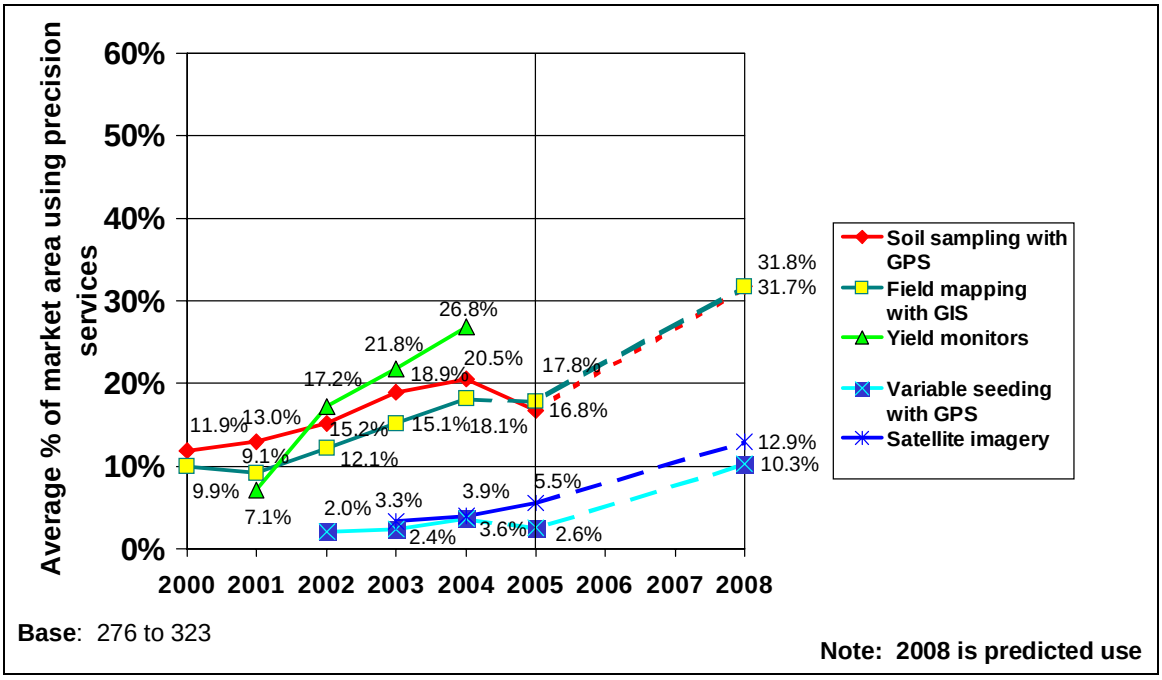
Figure 53. Respondents Generating a Profit from Precision Services in the Midwest



Customer Use of Site-Specific Services

To get a better understanding of how quickly growers are adopting precision services, survey participants were asked what percentage of the total acreage they served in their market area (all growers, not just current customers) was using various site-specific management services currently, and, in their opinion, what proportion of the local market acres would be using these services in 3 years. Figure 54 to Figure 57 show the trends over time in the estimated market use of specific precision agriculture management services.

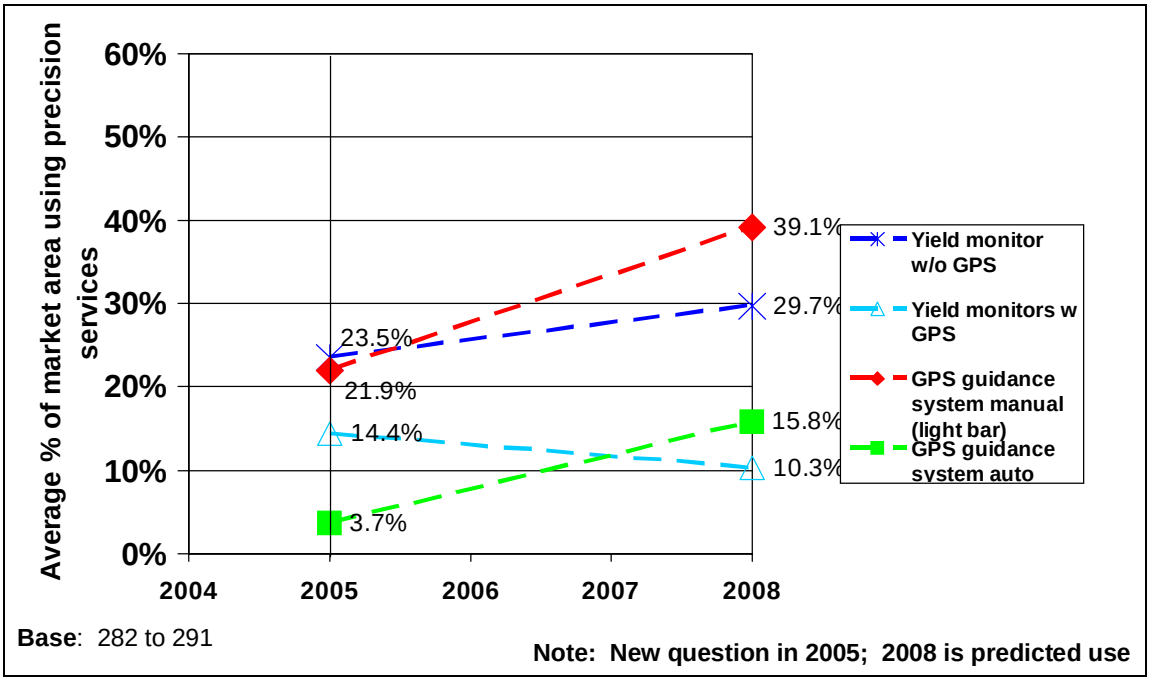
Figure 54. Estimated Market Area Using Precision Services



This year, a few new precision technologies were included for more detail. The use of yield monitors was split into yield monitor use with and without GPS. Two additional precision technologies were added: GPS guidance systems with manual control (lightbars) and GPS guidance systems with auto steer. Figure 55 shows the use of those technologies. On average, almost a quarter of each respondent's market area was using yield monitors without GPS (24 percent) and almost as much was covered with a manual control GPS guidance system (22 percent). Yield monitors with GPS were being used on an average of 14 percent of each respondent's market area, while GPS guidance systems with autosteer were being used on 4 percent of the market areas. The most growth in the future was expected for manual control GPS guidance systems.

Growth in the use of variable rate application continued its steady upward trend (Figure 56 and Figure 57), with continued growth expected into 2008. By 2008, respondents estimated that, on average, over a quarter of their market acreages would be having lime applied in a single-nutrient controller-driven application (29 percent of the markets, on average). By 2008, respondents also expected that market use of single nutrient controller-driven application of fertilizer would increase from 15 percent to 24 percent of the market area. Expected growth rates in the use of multi-nutrient controller-driven application were similar, though from a smaller base.

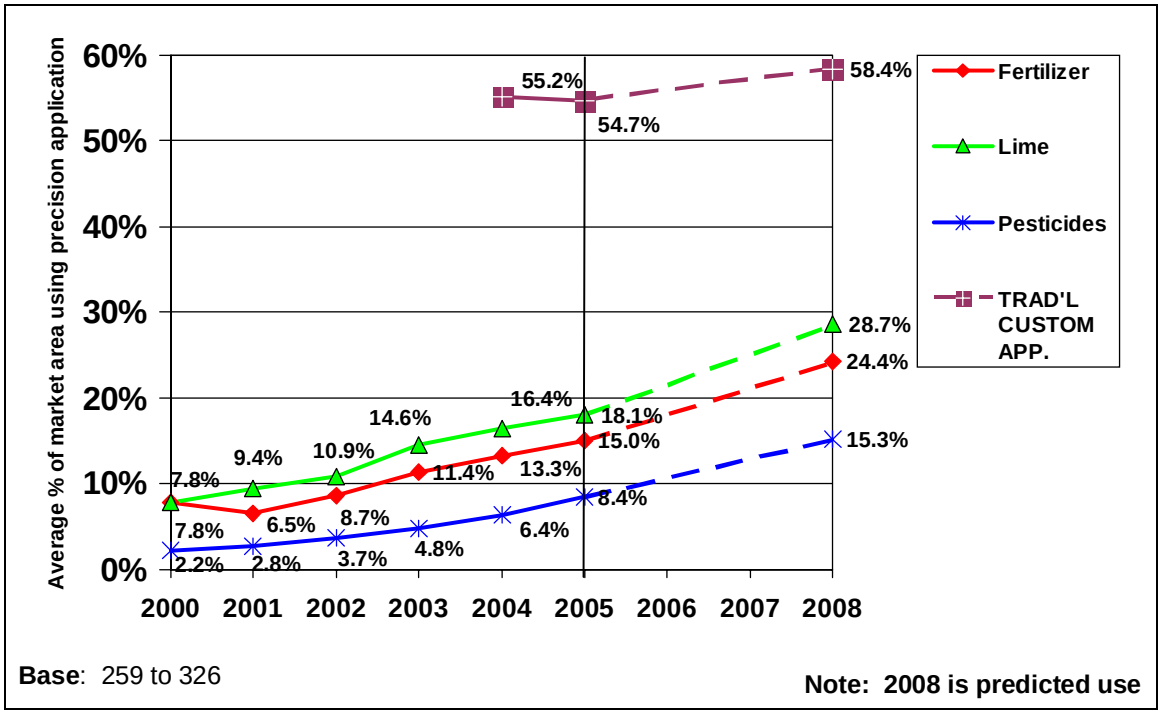
Figure 55. Estimated Market Area Using Yield Monitors and Guidance Systems



Base: 282 to 291

Note: New question in 2005; 2008 is predicted use

Figure 56. Estimated Market Area Using Single Nutrient Controller-Driven Application



Base: 259 to 326

Note: 2008 is predicted use

Figure 57. Estimated Market Area Using Multi-Nutrient Controller-Driven Application

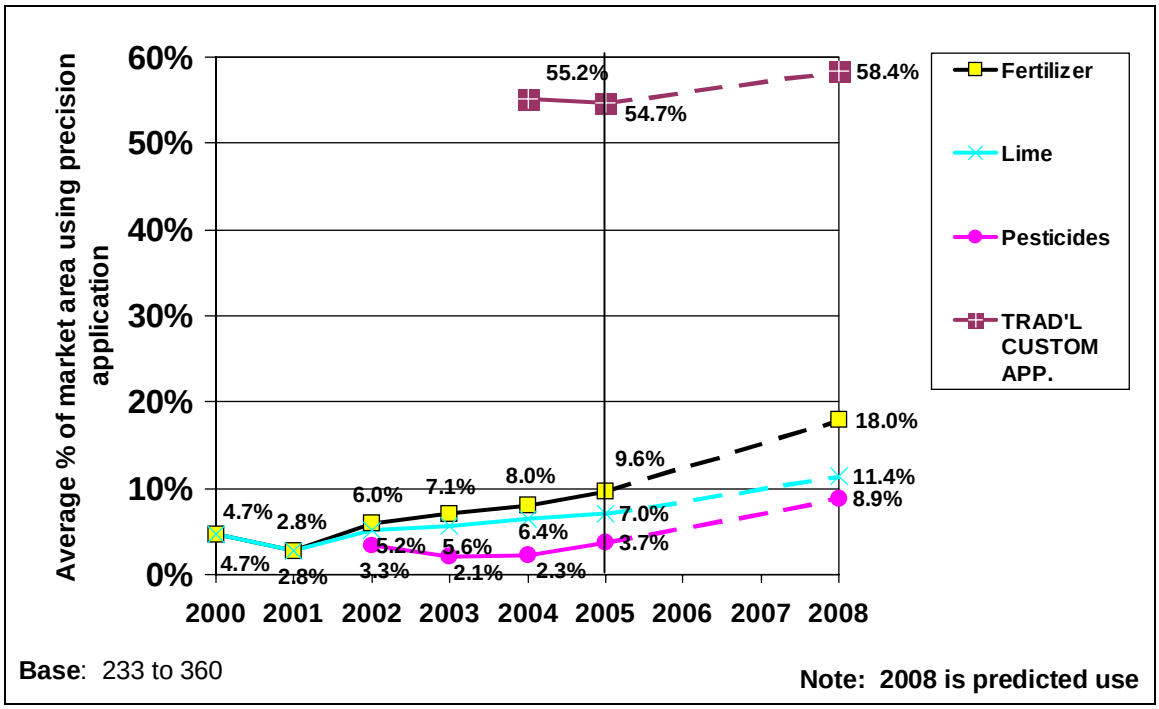
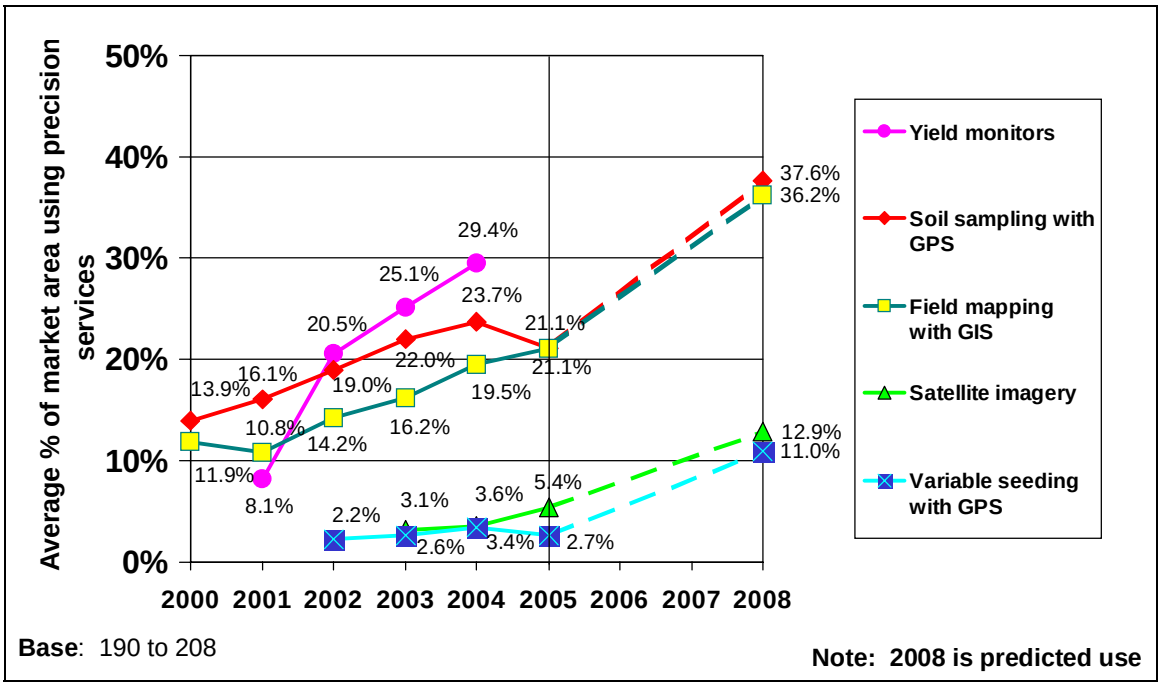


Figure 58 to Figure 65 show estimated market usage of precision services in the Midwest and in other non-Midwestern states. Some market use estimates were significantly higher in the Midwest than in other states. These included yield monitor usage (with and without GPS), soil sampling with GPS, field mapping with GIS, single-nutrient controller-driven variable rate application of fertilizer and lime, multi-nutrient controller-driven variable rate application of fertilizer, and GPS guidance system with manual control. There were no significant differences across regions for the other services.

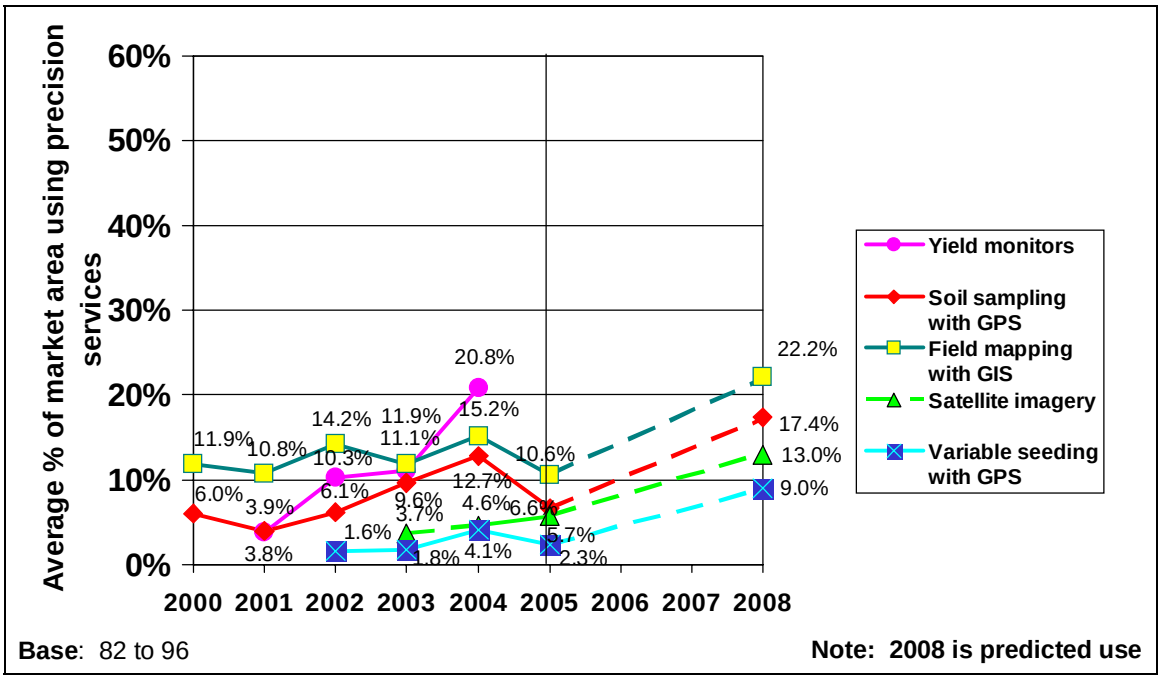
Figure 58. Estimated Market Area Using Precision Services in the Midwest



Base: 190 to 208

Note: 2008 is predicted use

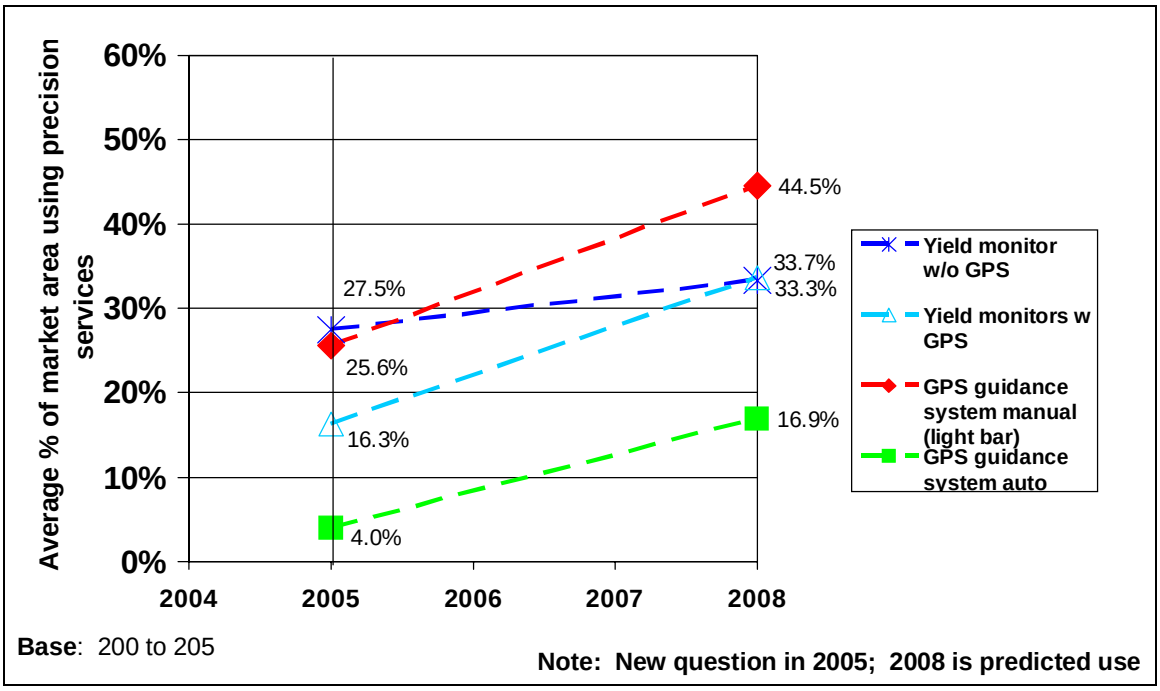
Figure 59. Estimated Market Area Using Precision Services in the Other States



Base: 82 to 96

Note: 2008 is predicted use

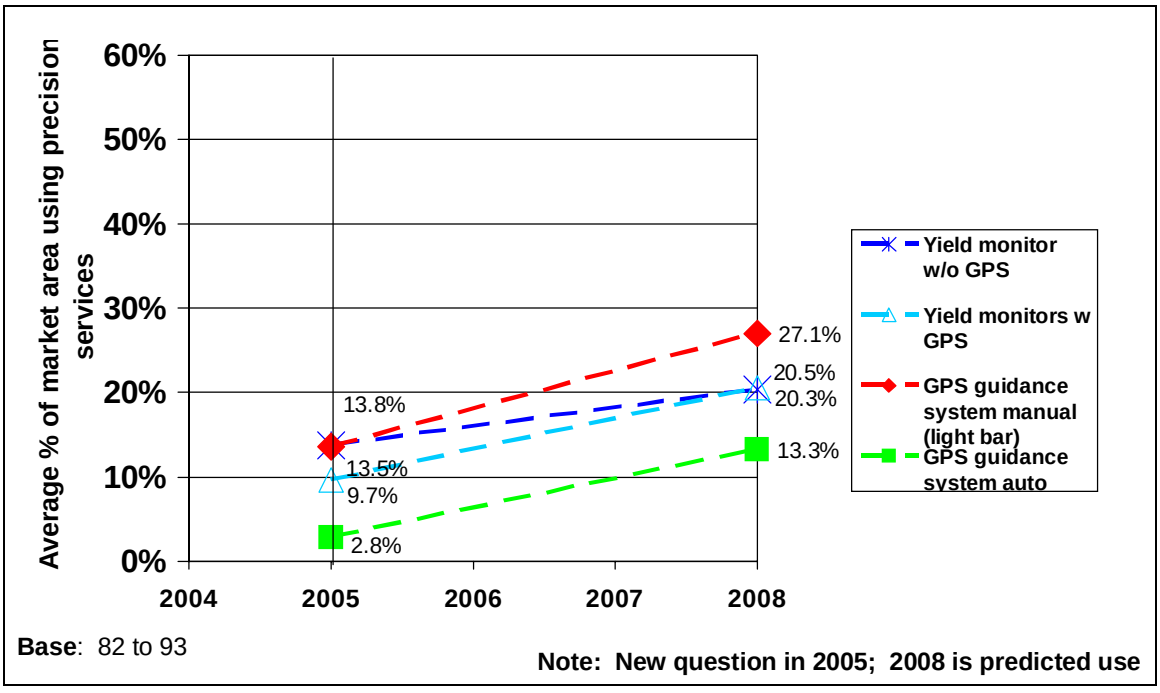
Figure 60. Estimated Market Area Using Yield Monitors and Guidance Systems in the Midwest



Base: 200 to 205

Note: New question in 2005; 2008 is predicted use

Figure 61. Estimated Market Area Using Yield Monitors and Guidance Systems in Other States



Base: 82 to 93

Note: New question in 2005; 2008 is predicted use

Figure 62. Estimated Market Area Using Single Nutrient Controller-Driven Application in the Midwest

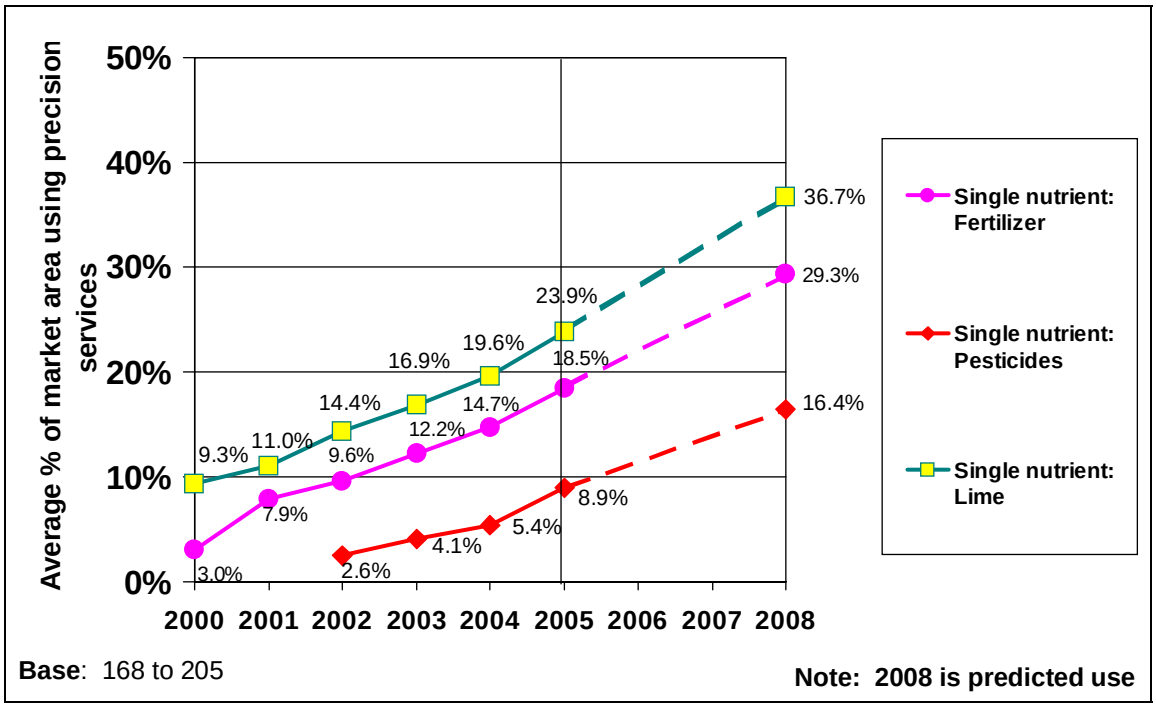


Figure 63. Estimated Market Area Using Single Nutrient Controller-Driven Application in Other States

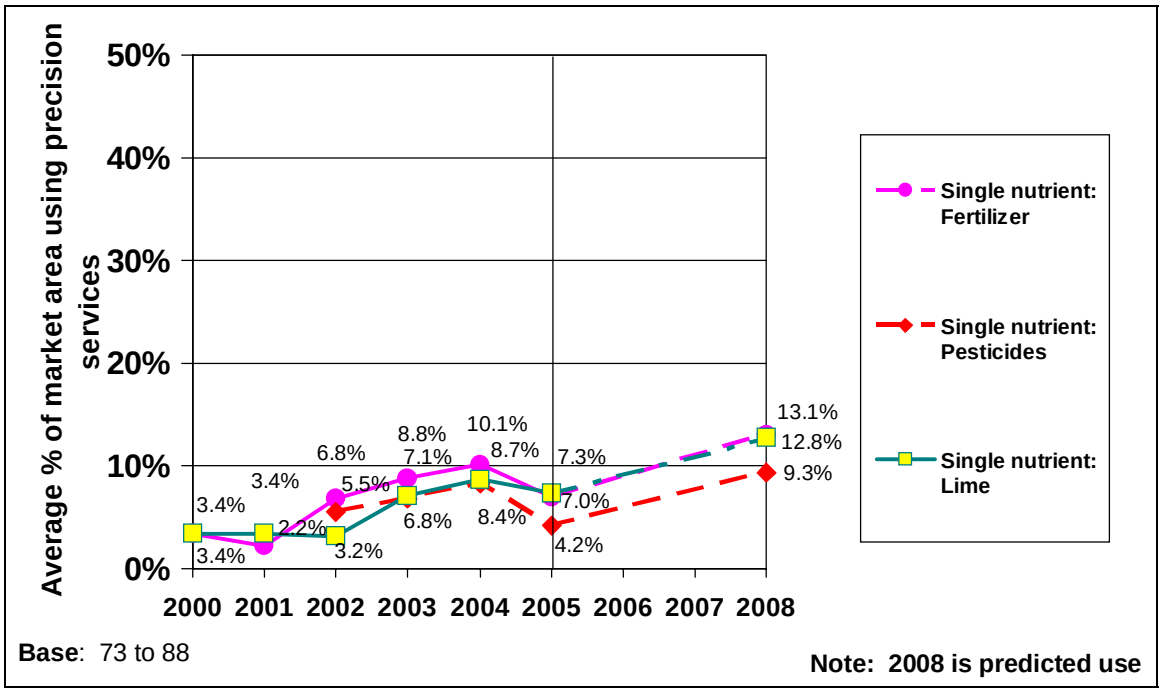


Figure 64. Estimated Market Area Using Multi Nutrient Controller-Driven Application in the Midwest

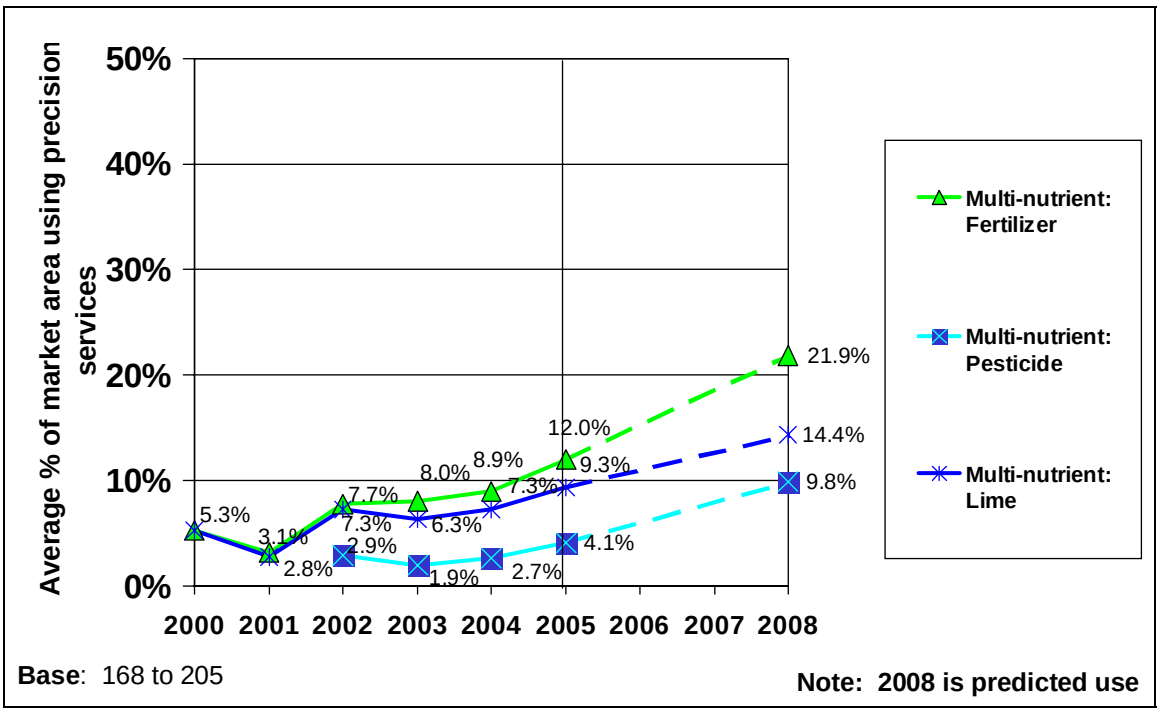
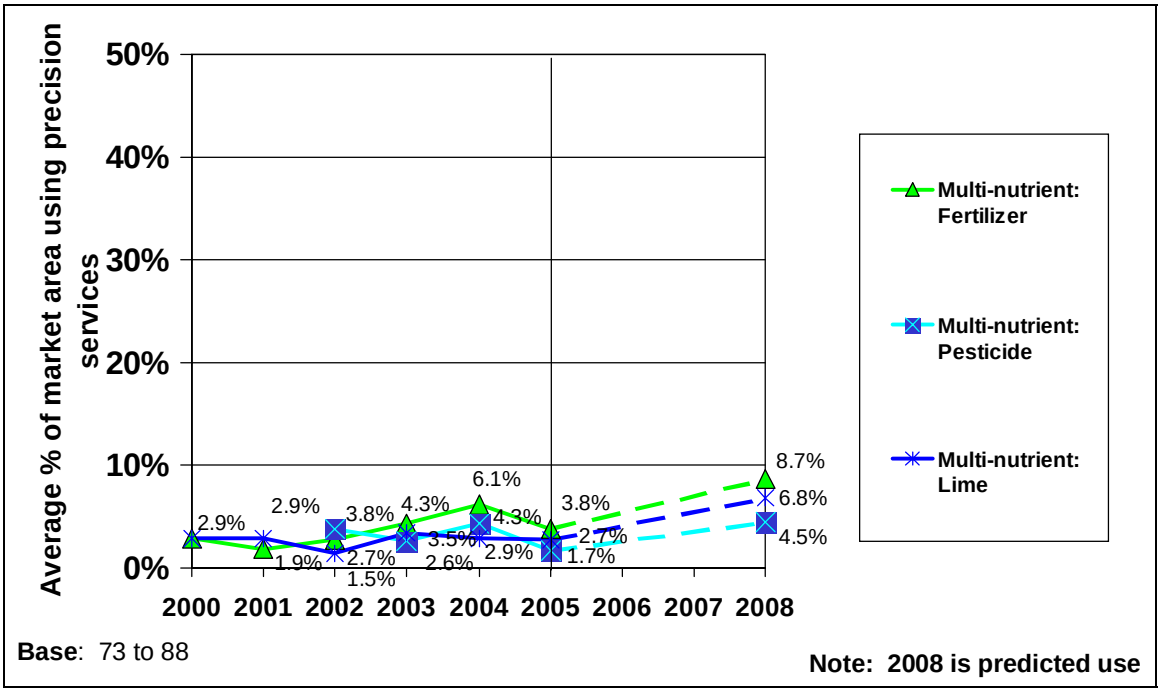


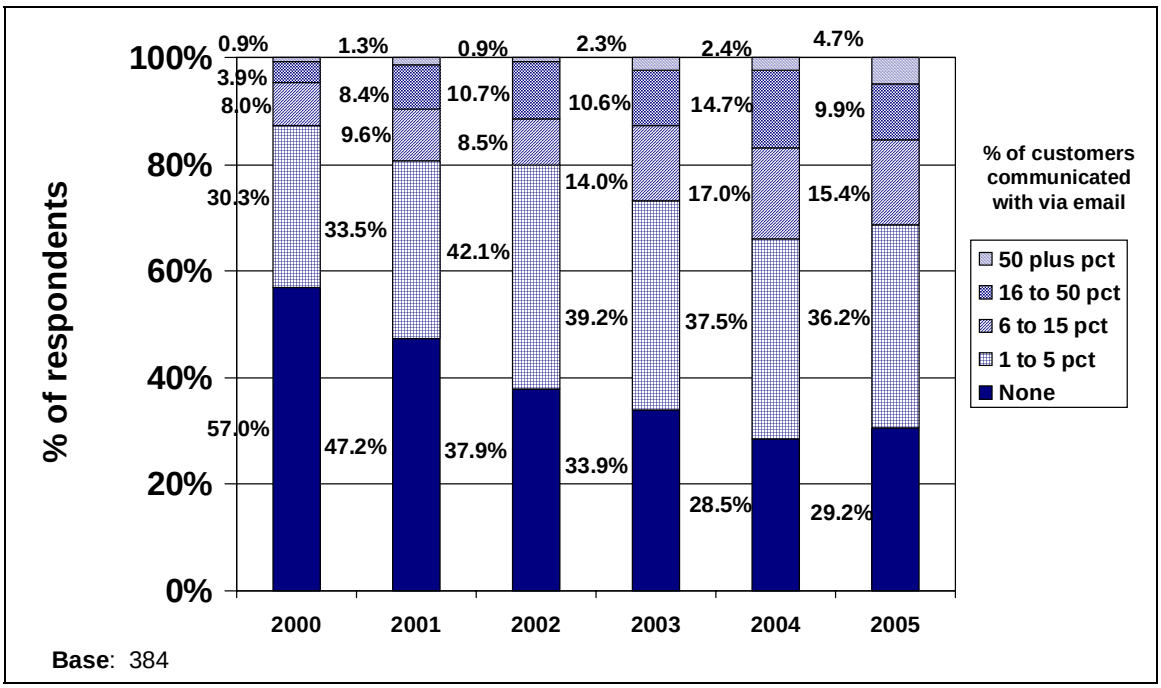
Figure 65. Estimated Market Area Using Multi Nutrient Controller-Driven Application in Other States



Use of Email

The survey also looked at email as another type of technology that is changing how business is conducted in today's market. Dealerships were asked how many of their customers they were communicating with through email. There was very little change in the use of email from 2004 to 2005. Figure 66 shows that more than 7 out of 10 of the respondents (71 percent) used email to communicate with at least some of their customers but only 5 percent were using it with half or more of their customers.

Figure 66. Customers Communicated With Via Email

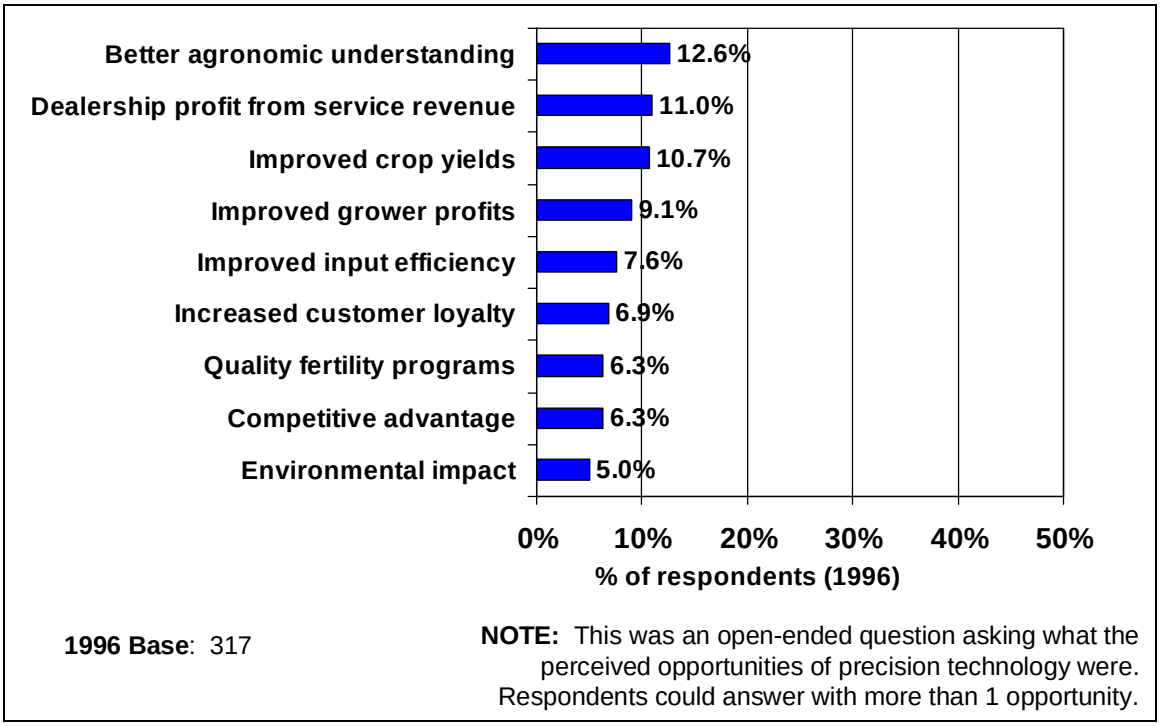


Ten Years of Change

This survey was first conducted 10 years ago, in 1996. At that time, the precision/site specific management world was full of uncertainties, with much speculation about its great potential as well as doubts about its long term effectiveness. Now, after 10 years, we've gone back to the original questionnaire to see what has changed as the agricultural industry has incorporated precision technologies and practices into their businesses.

In 1996, one of the questions asked of respondents was an open-ended question about what opportunities they saw for site-specific agricultural technologies. Because this was an open-ended question, responses could cover any topic and respondents could provide more than one answer. Figure 67 shows the results from this question. The biggest perceived opportunity was in better agronomic understanding overall due to the more in-depth data collection and analysis (13 percent of respondents). This was followed by 11 percent of the respondents who saw greater dealership profit from service revenues and another 11 percent who thought there would be improved crop yields. The rest of the top nine opportunities are shown in the chart and were each mentioned by fewer than 10 percent of the respondents.

Figure 67. Opportunities for Precision Technology in 1996

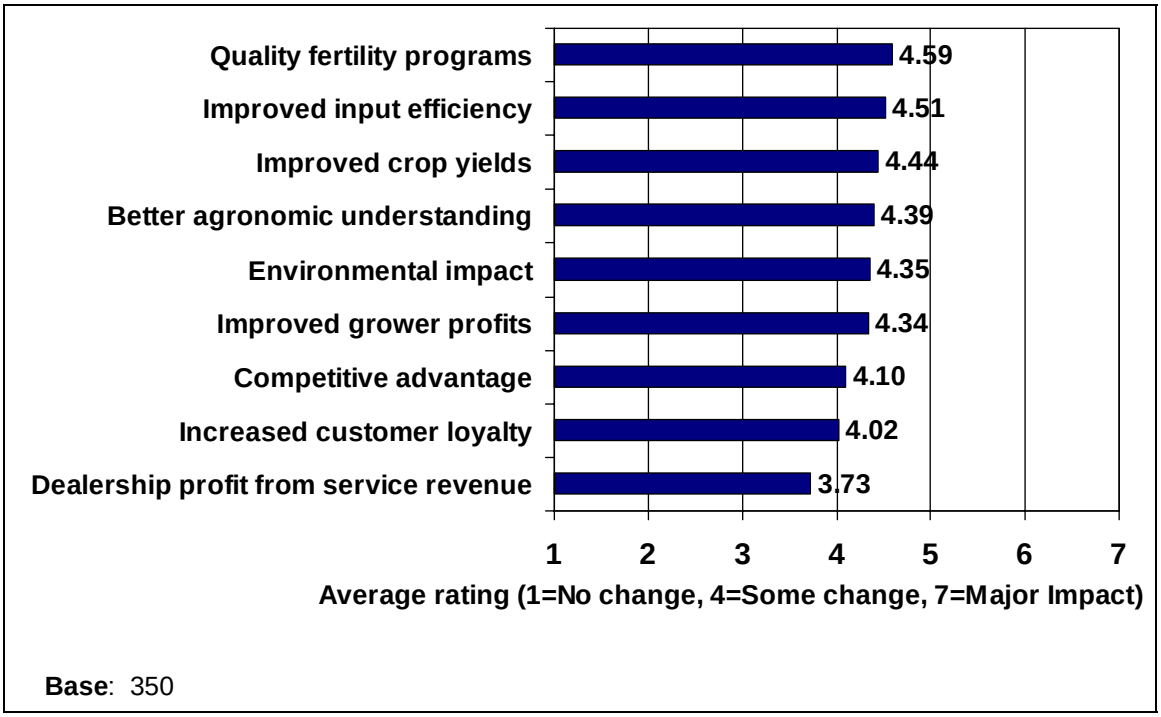


1996 Base: 317

NOTE: This was an open-ended question asking what the perceived opportunities of precision technology were. Respondents could answer with more than 1 opportunity.

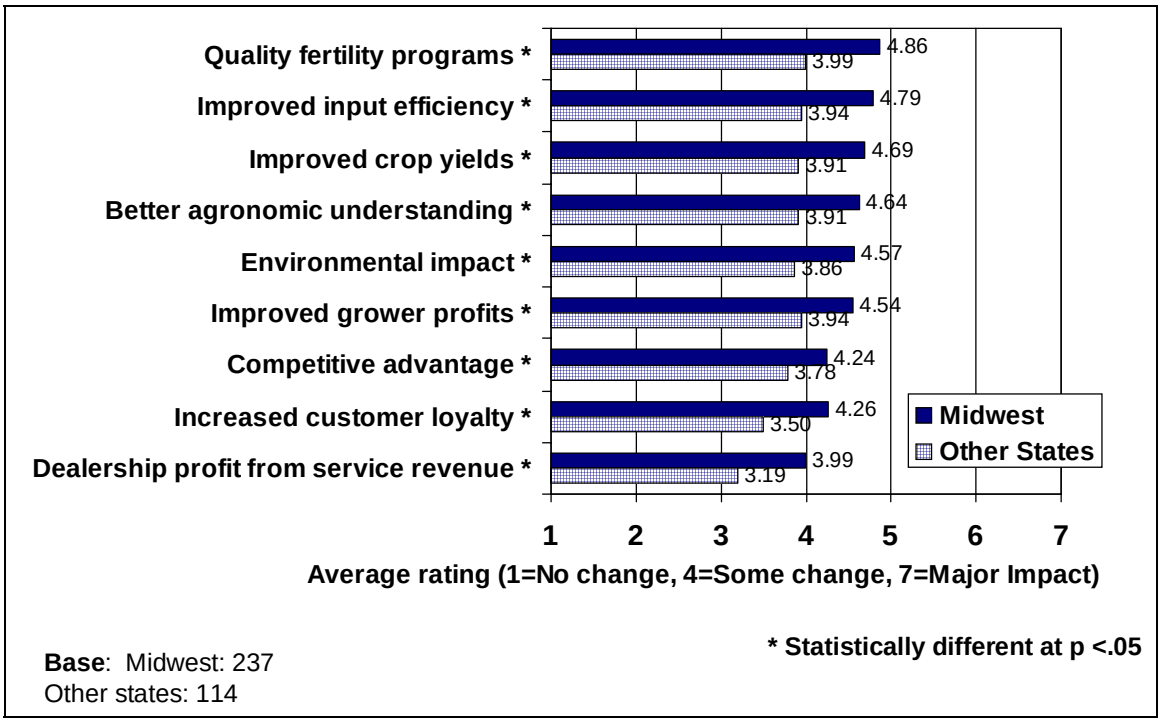
In the 2005 survey, the same top 9 opportunities were listed and respondents were asked what type of impact they had seen in each area in the past 10 years due to precision technology, from 1="No impact" to 7 = "Major impact." Figure 68 shows the average ratings for each opportunity. All except dealership profit from service revenue were rated between 4 ("some change") and 4.6. Only dealership profit from service revenue was rated lower.

Figure 68. Benefits of 10 Years of Precision Rated in 2005



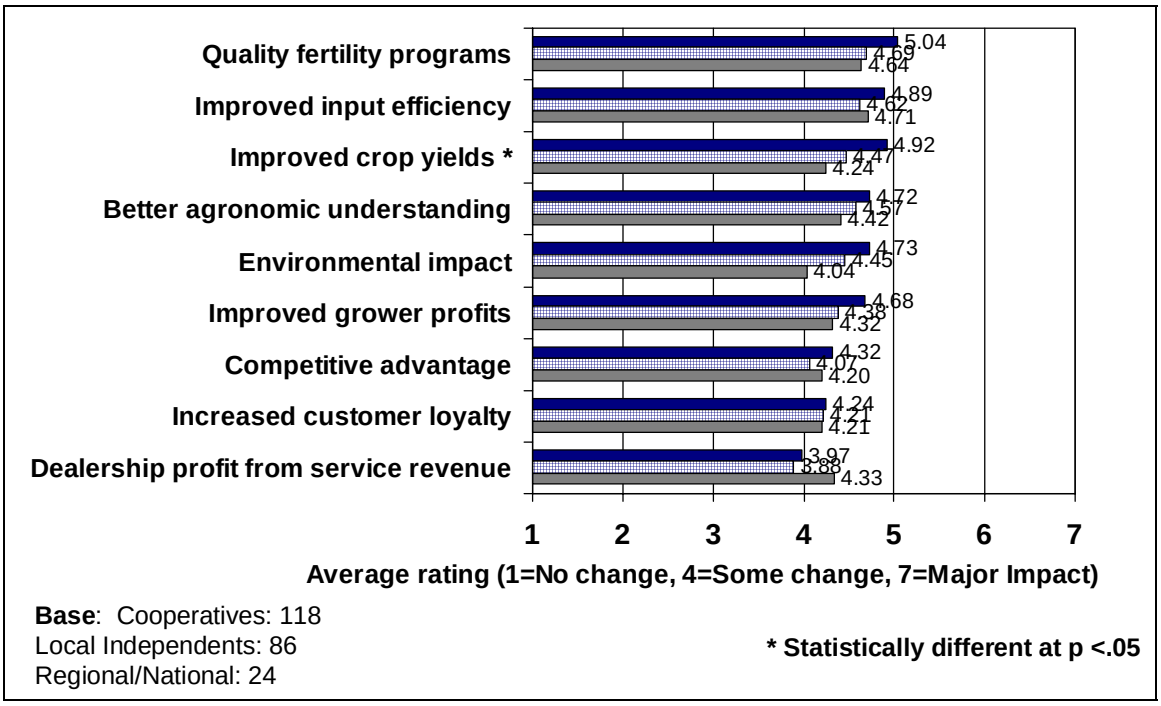
There were significant differences in these ratings by region. All 9 opportunities were rated significantly greater by respondents from the Midwest than respondents from other states (Figure 69). The top rated benefit in both regions was quality fertility programs (rated 4.86 in the Midwest and 3.99 in other states). However, in second place for non-Midwestern states was improved input efficiency and improved grower profits (both rated 3.94 out of 7). In the Midwest, improved grower profits were 6th in the list of 9 benefits rated.

Figure 69. Benefits of 10 Years of Precision Rated in 2005 by Region



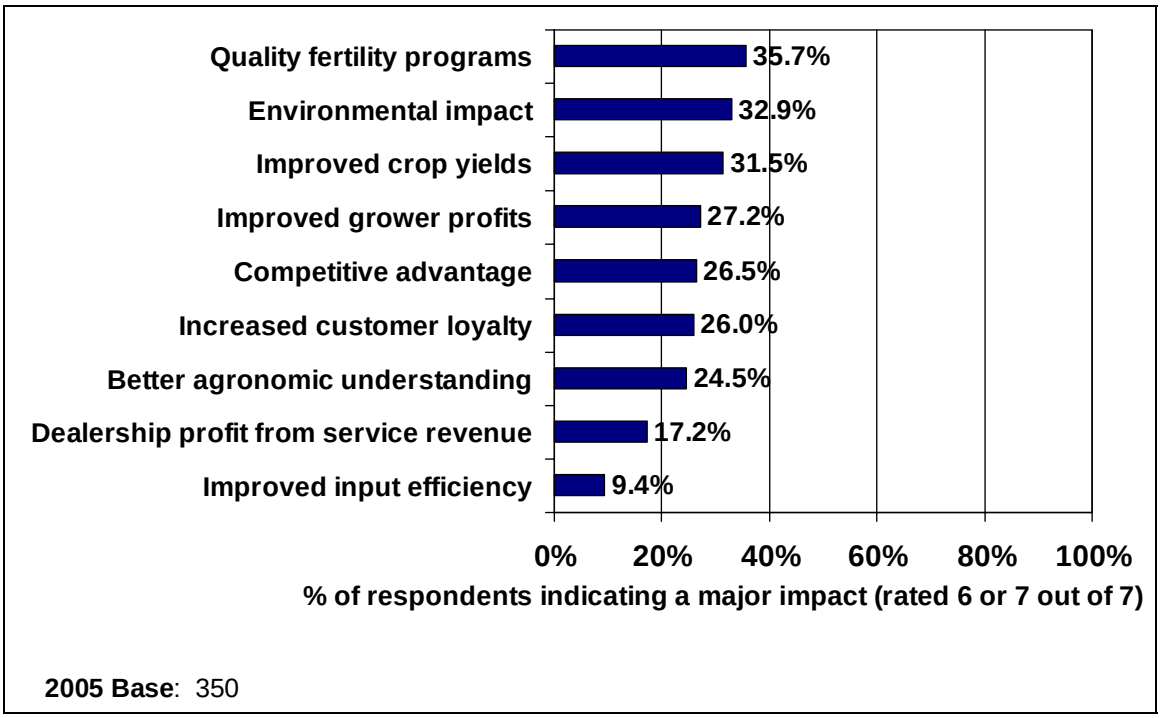
Despite there being significant differences in precision technology adoption between the different organizational types in the Midwest, there were very few significant differences in their ratings of the benefits of precision technology (Figure 70). Only improved crop yields were rated differently, where the most intense precision technology users (cooperatives) rated it significantly more of a benefit than either local independents or regional/nationals.

Figure 70. Benefits of 10 Years of Precision Rated in 2005 by Organizational Type in the Midwest



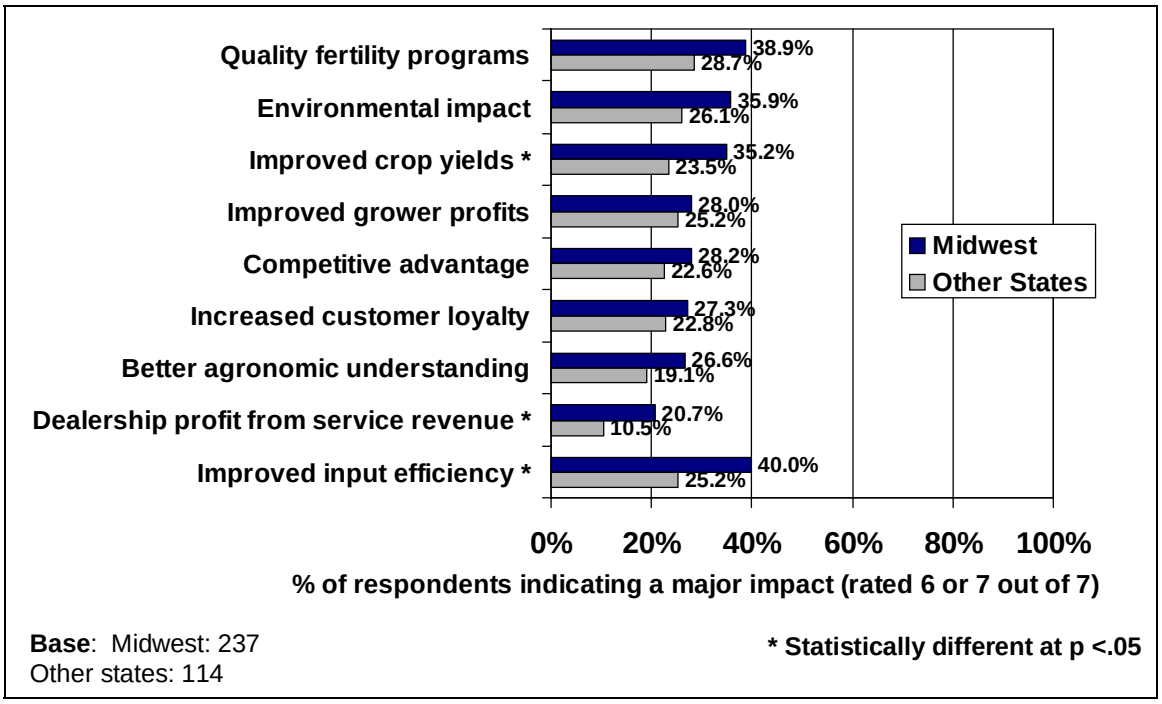
Because the average benefit ratings were so close to each other, it is sometimes useful to look at the results in an alternative way. Figure 71 and Figure 72 show the "Top Box" ratings for the sample as a whole and by region – the percentage of respondents who rated precision technology as having had a major impact on the various opportunities (a 6 or 7 out of 7). Over a third of the respondents (36 percent) thought that precision technology had a major impact on quality fertility programs. Almost a third (33 percent) thought there had been a major impact on the environment, and 32 percent said there were major impacts on improved crop yields. The benefit which the fewest respondents felt had been impacted in a major way by precision technology was improved input efficiency, with only 9 percent saying there had been a major impact in that area, despite that being one of the major areas expected to be impacted 10 years ago.

Figure 71. Benefits of 10 Years of Precision: Top Box



In breaking this out by region, as expected, all benefits were seen to be impacted by precision technology more in the Midwest than in other states (Figure 72), though the only statistical differences were in how they rated the impact of precision technology on increased crop yields, dealership revenue from service revenue, and improved input efficiency. Over a third of the respondents in the Midwest (35 percent) thought there was a major impact on improved crop yields compared to fewer than a quarter of those respondents from other states (24 percent). Twice as many respondents in the Midwest saw a major impact on dealership profit from service revenue than respondents from other states (21 percent compared to 11 percent of the respondents). And, for improved input efficiency, 40 percent of the Midwest respondents saw a major impact compared to only 25 percent of the non-Midwestern respondents.

Figure 72. Benefits of 10 Years of Precision by Region: Top Box



Summary

With precision technology being available to the agricultural industry for more than a decade now, some of the results of the 'revolution' are becoming clearer. Some precision components have become "status quo" -- yield monitors are almost standard equipment on new combines, some dealers offer almost every type of precision service that is available, and many dealers are using the technology for improving internal business efficiencies. There are obviously still areas where precision technology has not been adopted – either because of the geography or the economics or the crops involved.

As the technology has been adopted, some dealerships have seen greater profits due to the technology while many others haven't. Other benefits that were seen to be very promising 10 years ago have not necessarily come to pass yet. Whether they will or not (for example, better agronomic understanding and environmental understanding) will have to be seen in the years to come.

APPENDIX I: Questionnaire

10th ANNUAL PRECISION AG SURVEY

CropLife • Purdue Center for Food and Agricultural Business • PURDUE UNIVERSITY

Play a part in agricultural history! *Please fill out and return this brief survey in the enclosed pre-addressed, postage-paid envelope, and send to:* **CropLife***, 37733 Euclid Ave., Willoughby, OH 44094; Fax: 440-942-0662.* ***PLEASE RETURN BY FEBRUARY 11, 2005.***

1. Your primary responsibility: [*check one*]

☐ Owner/general manager/location manager ☐ Departmental manager
☐ Precision manager ☐ Application manager
☐ Technical consultant/agronomist ☐ Sales/sales management
☐ Other: _____ (Please specify)

2. Please indicate the number of full-time staff agronomists you have access to at your location or you share with other locations:

Full-time agronomists **at your location**: _____ "0" if None
Full-time agronomists shared **with other locations**: _____ "0" if None

3. Are you a: [*check one*]

☐ Cooperative ☐ Independent dealership
☐ Part of a national or regional (multi-state) chain of retail dealerships (not a cooperative)
☐ Other: _____ (Please specify)

4. What were the **total annual retail sales** (in dollars) of agronomic products and services (fertilizer, chemicals, seed, services) **at this location** in 2004?

☐ Under $1,000,000 ☐ $3,000,000 - under $5,000,000
☐ $1,000,000 - under $2,000,000 ☐ $5,000,000 or more
☐ $2,000,000 - under $3,000,000

5. How many total retail outlets does ***your company*** own or manage? [*check one*]

☐ None ☐ 1 ☐ 2-5 ☐ 6-15 ☐ 16-25 ☐ More than 25

6. What is the average size (in acres) of your customers? [*check one*]

☐ Under 200 acres ☐ 501 to 1000
☐ 201 to 500 ☐ Over 1000

7. Do you provide custom application? ☐ No → go to Question 12 ☐ Yes → continue with Question 8

8. In a typical year how many total acres do you custom apply **at your location** (fertilizer, chemicals, seeding – total acres including multiple applications)? [*check one*]

☐ None → go to Question 12
☐ Under 10,000 acres ☐ 25,001 to 50,000 acres
☐ 10,001 to 25,000 acres ☐ over 50,000 acres

9. In 2004, approximately what proportion of your total fertilizer sales were custom applied? _____%

10. In 2004, approximately what proportion of your total herbicide/pesticide sales were custom applied? _____%

11. In 2004, approximately what proportion of your total custom application (total acres = all products) used:

GPS guidance systems with manual control (light bar)? _____% "0" if None
GPS guidance systems with automatic control (autosteer)? _____% "0" if None

12. Do you offer soil sampling following a grid pattern and/or by soil type?

☐ Grid pattern — Grid size most commonly used?
☐ < 1 acre ☐ 1 ac. - 2.49 ac. ☐ 2.5 ac. ☐ 2.51 ac. - 5 ac. ☐ Other:_____
☐ Soil type
☐ By zone other than soil type ☐ Other: _____

13. In which of the following ways does your dealership use precision technology? (check all that apply)

☐ Precision agronomic services for customers (such as soil sampling with GPS, GIS field mapping, etc.)
☐ GPS guidance systems with manual control (**light bar**) for fertilizer/chemical application
☐ GPS guidance systems with automatic control (**autosteer**) for fertilizer/chemical application
☐ Satellite/aerial imagery for internal dealership purposes
☐ Soil electrical conductivity (Veris) mapping
☐ Field mapping with GIS to document work for billing/insurance/legal purposes
☐ Telemetry to send field information to home office from field
☐ GPS to manage vehicle logistics, tracking location of vehicles, and guiding vehicles to next site
☐ **Don't use precision technology**

14. Which "site-specific" ("precision") services/products will you offer in the following time periods?

Service	By Fall 2005	Offer by 2007	Never/ Don't Know	Don't offer now but did
Field mapping (with GIS)	☐	☐	☐	☐
Manual variable rate application				
Fertilizer	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Chemicals	☐	☐	☐	☐
Controller-driven (GPS), **single** nutrient variable rate application				
Fertilizer	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Chemicals	☐	☐	☐	☐
Controller-driven (GPS), **multiple** nutrient variable rate application				
Fertilizer	☐	☐	☐	☐
Lime	☐	☐	☐	☐
Chemicals	☐	☐	☐	☐
Yield monitor sales/support/rental	☐	☐	☐	☐
Yield monitor data analysis	☐	☐	☐	☐
Variable seeding rates without GPS	☐	☐	☐	☐
Variable seeding rates with GPS	☐	☐	☐	☐
Satellite/aerial imagery	☐	☐	☐	☐
Agronomic recommendations based on GPS/GIS data	☐	☐	☐	☐
Soil sampling with GPS	☐	☐	☐	☐

15. If you currently offer any of these services/products, what is the average per acre/per unit price you charge for individual services? ***(do not include bundled pricing)***

Service	Price $/acre	Price $/other units ($/map, $/hour, etc.)
Custom application (not precision)	$_____/acre	$_____/(specify units)_____
Field mapping (with GIS)	$_____/acre	$_____/(specify units)_____
Manual variable rate application		
Fertilizer	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____

Controller-driven (GPS), **single** nutrient variable rate application		
Fertilizer	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____
Controller-driven (GPS), **multiple** nutrient variable rate application		
Fertilizer	$_____/acre	$_____/(specify units)_____
Lime	$_____/acre	$_____/(specify units)_____
Chemicals	$_____/acre	$_____/(specify units)_____
Yield monitor data analysis	$_____/acre	$_____/(specify units)_____
Variable seeding rates without GPS	$_____/acre	$_____/(specify units)_____
Variable seeding rates with GPS	$_____/acre	$_____/(specify units)_____
Satellite/aerial imagery	$_____/acre	$_____/(specify units)_____
Agronomic recommendations based on GPS/GIS data	$_____/acre	$_____/(specify units)_____
Soil sampling with GPS	$_____/acre	$_____/(specify units)_____

16. For the following services **that you offer**, currently how profitable is each specific service for your dealership?

	I am not close to breaking even	I am just covering variable costs (See NOTE)	I am covering both variable and fixed costs	I am generating a profit	Don't know	Don't offer
Custom application (Not-precision)	1	2	3	4	5	6
Manual variable rate application	1	2	3	4	5	6
Controller-driven (GPS) **single** nutrient variable rate application	1	2	3	4	5	6
Controller-driven (GPS), **multiple** nutrient variable rate application	1	2	3	4	5	6
Data analysis for yield monitors	1	2	3	4	5	6
Variable seeding rates with GPS	1	2	3	4	5	6
Satellite/aerial imagery	1	2	3	4	5	6
Soil sampling with GPS	1	2	3	4	5	6
Total precision program, all components	1	2	3	4	5	6

NOTE:

Variable Costs are the costs of actually performing the service — costs increase or decrease with how much business you do (fuel, supplies, etc.)
Fixed Costs are the costs of making the service available (depreciation on equipment, computers, labor, training, etc.)

17. Ten years ago, we asked dealers to identify the most important benefits (for the dealership or the farm) they believed that precision or site-specific agriculture would bring. The dealers listed the following items (in no particular order). Relative to 10 years ago, rate the following possible benefits as to the impact site-specific technologies have had on your dealership and/or on your market area (regardless of whether or not your dealership is using any precision technologies). Use a scale of 1 (no change) to 7 (major impact):

(1 = No Change; 4 = Some Change; 7 = Major Impact)

Overall agronomic understanding	1	2	3	4	5	6	7
Quality of fertility programs	1	2	3	4	5	6	7
Environmental impact	1	2	3	4	5	6	7
Competitive advantage in the marketplace	1	2	3	4	5	6	7
Customer loyalty	1	2	3	4	5	6	7
Dealership profits due to service revenues	1	2	3	4	5	6	7
Crop yields	1	2	3	4	5	6	7
Grower profits	1	2	3	4	5	6	7
Input efficiency for growers (yield per unit inputs)	1	2	3	4	5	6	7

18. **Please answer the following question *whether or not* you offer any precision services.**
Approximately what percentage of the <u>total acreage in your market area</u> **(all growers, not just your current customers)** is currently using the following site-specific agricultural techniques? Approximately what percentage of the total acreage will be using these techniques in three years (the year 2008)?

% of market acres (fill in blank with a percentage; *indicate 0 if none*)

Service	**Currently**	**3 years from now (2008)**
Custom application of any type	_____%	_____%
Field mapping (with GIS)	_____%	_____%
Controller-driven (GPS), **single** nutrient variable rate application		
Fertilizer	_____%	_____%
Lime	_____%	_____%
Chemicals	_____%	_____%
Controller-driven (GPS), **multiple** nutrient variable rate application		
Fertilizer	_____%	_____%
Lime	_____%	_____%
Chemicals	_____%	_____%
GPS guidance systems with manual control (light bar) for field operations (tillage, planting, etc.)	_____%	_____%
GPS guidance systems with automatic control (autosteer) for field operations (tillage, planting, etc.)	_____%	_____%
Yield monitor without GPS	_____%	_____%
Yield monitor with GPS	_____%	_____%
Variable seeding rates with GPS	_____%	_____%
Satellite/aerial imagery	_____%	_____%
Soil sampling with GPS	_____%	_____%

19. What proportion of your customers has your location communicated with via e-mail during the last 12 months?

☐ None ☐ 1%-5% ☐ 6%-15% ☐ 16%-25% ☐ 26%-50% ☐ Over 50%

20. What is your two-letter state abbreviation? _____

21. What is your ZIP code? _____

Thank you for your cooperation! PLEASE SEND YOUR COMPLETED SURVEY TO:
CropLife, 37733 Euclid Ave., Willoughby, OH 44094, Fax: 440-942-0662.